United States Department of Agriculture

Soil Conservation Service

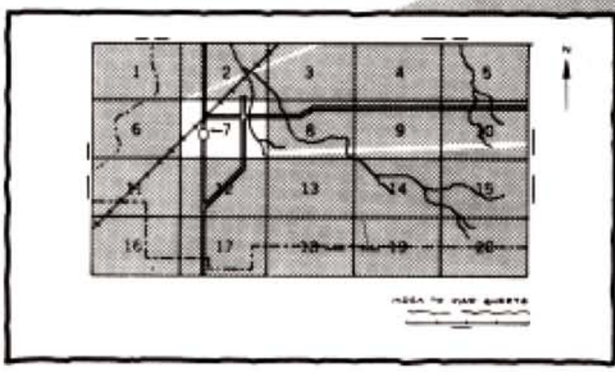
In cooperation with the University of Florida Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and the Florida Department of Agriculture and Consumer Services

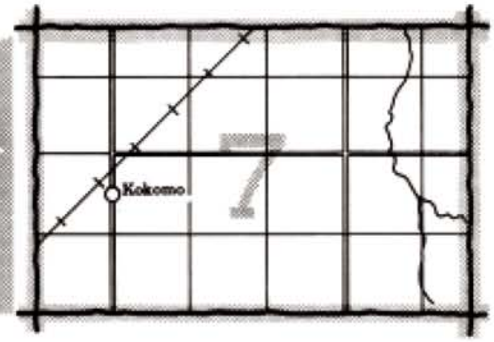
Soil Survey of Broward County Florida

Eastern Part

HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"





2. Note the number of the map sheet and turn to that sheet.

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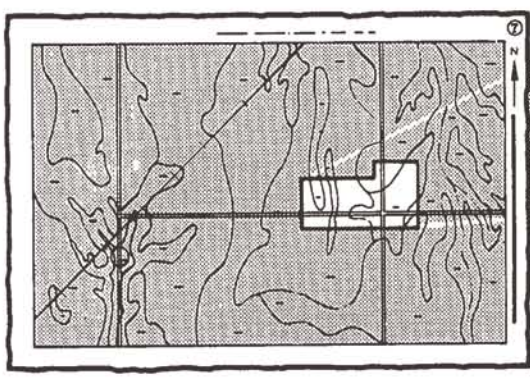

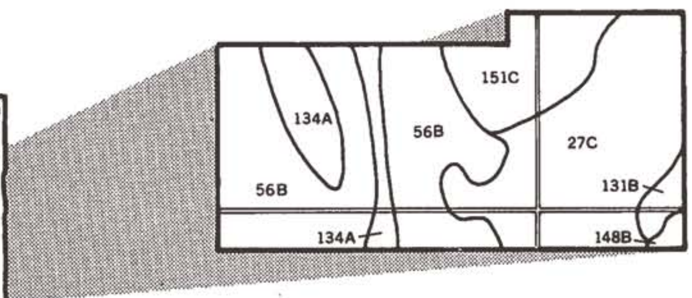

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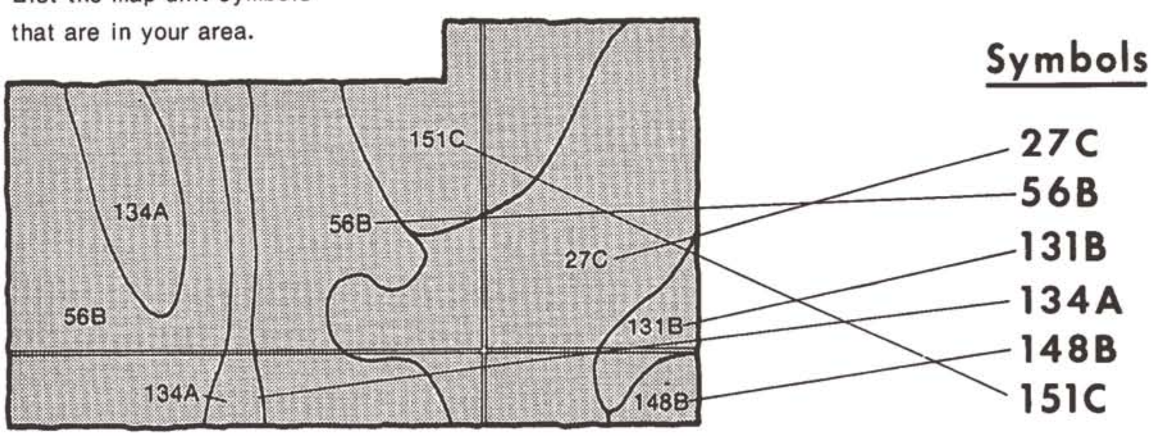
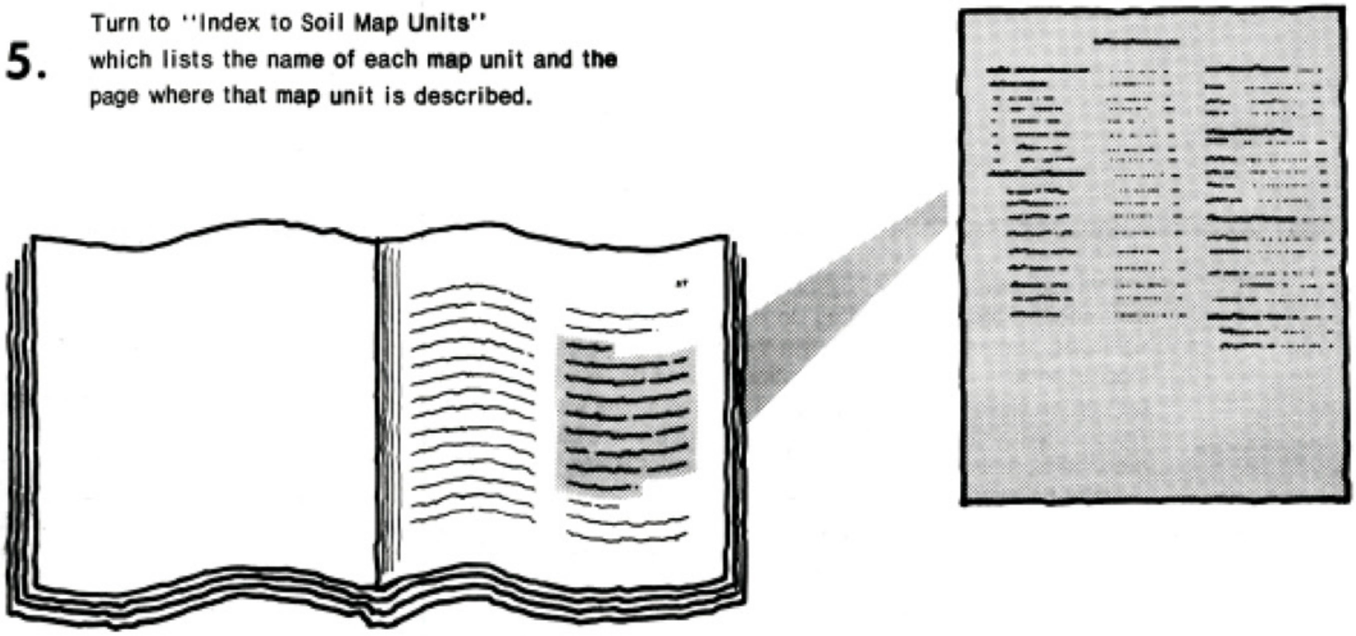
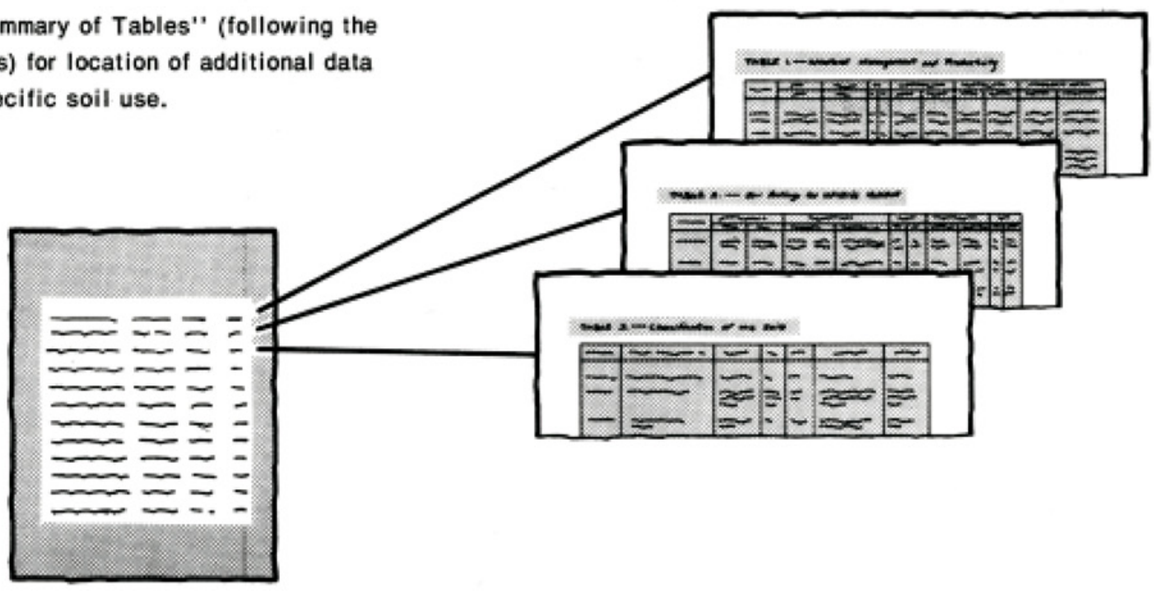


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1979-80. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service, the University of Florida Institute of Food and Agricultural Sciences, Agricultural Experiment Stations and Soil Science Department, and the Florida Department of Agriculture and Consumer Services. It is part of the technical assistance furnished to the Broward Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

A soil survey of Broward County, Florida, was published in 1976 (*8*). This survey supersedes that older survey. It covers a larger area and provides additional information.

Cover: Areas of Beaches and the adjacent Palm Beach-Urban land complex have been developed to make use of the ocean-front setting. Groins are used to control beach erosion.

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Foreword

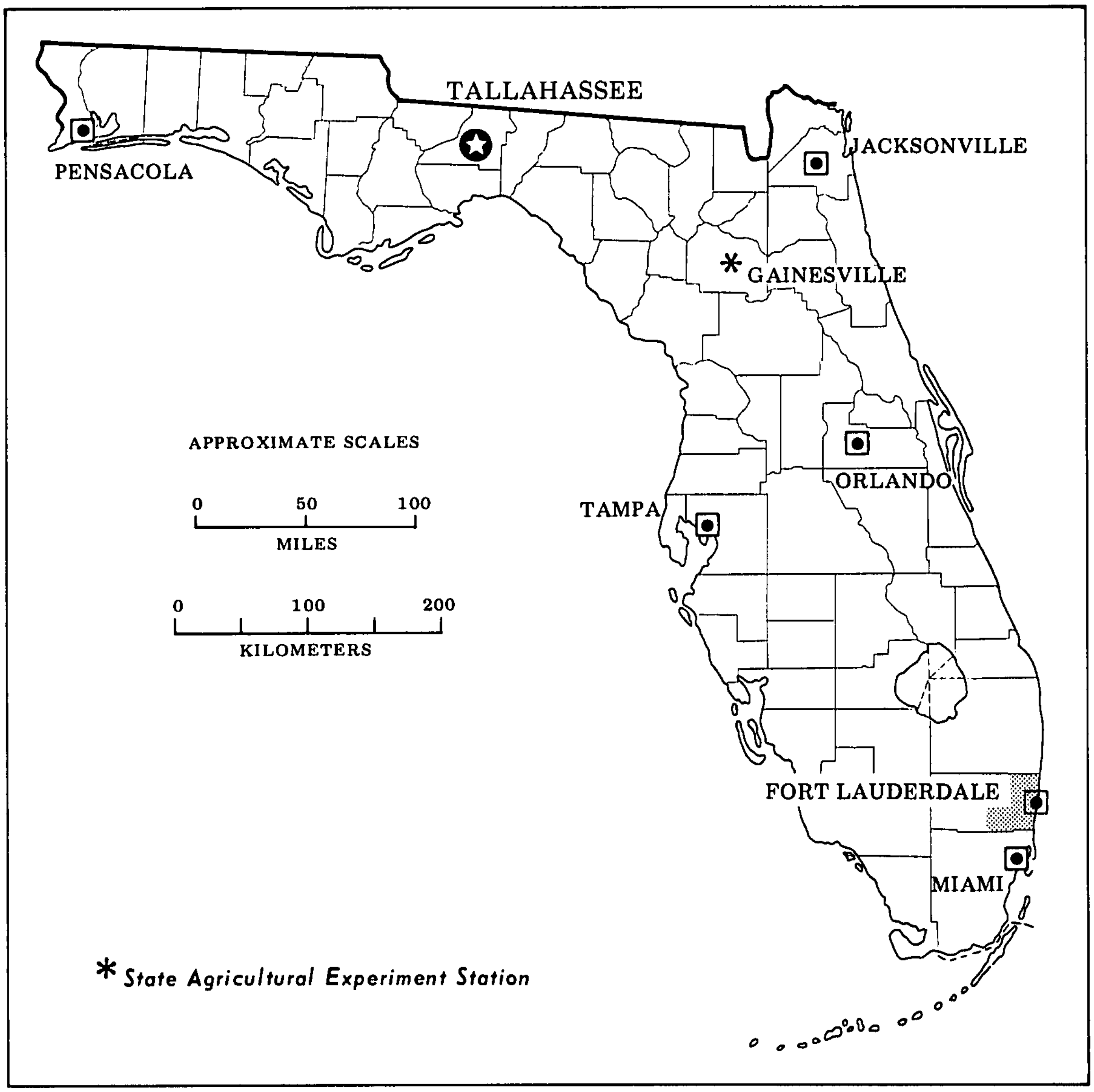
This soil survey contains information that can be used in land-planning programs in Broward County, Eastern Part. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

James W. Mitchell
State Conservationist
Soil Conservation Service



Location of Broward County, Eastern Part, in Florida.

Soil Survey of Broward County, Florida Eastern Part

By Robert F. Pendleton, Hershel D. Dollar, Lloyd Law, Jr.,
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United States Department of Agriculture, Soil Conservation Service,
in cooperation with the
University of Florida, Institute of Food and Agricultural Sciences,
Agricultural Experiment Stations and Soil Science Department, and the
Florida Department of Agriculture and Consumer Services

Broward County, Eastern Part, is in the southeastern part of Florida. It has a total land area of 265,273 acres, or about 414.5 square miles. Fort Lauderdale is the county seat of Broward County. The survey area is bounded by Dade County on the south, a conservation area on the west, and Palm Beach County on the north.

Most of the survey area is low, nearly level land at an elevation of 2 to 10 feet above sea level. Two dominant sand ridges are in the area. One is the Atlantic Coastal Ridge, which extends from Palm Beach County and ends south of Pompano. The other is known as Pine Island and is west of Davie and north of Cooper City. This ridge consists of only about 400 acres but is at the highest elevation, 29 feet, in the survey area. The average temperature in the survey area is 75.4° F. Rainfall is abundant, but is unevenly distributed.

The county has a population of 1,005,315. Almost all of the people live east of the conservation area.

Generally, farm activity has diminished, but some citrus crops, winter truck crops, and cattle are produced.

Broward County, Eastern Part, is very popular with tourists and retired people because of the warm climate in winter and the various recreational facilities.

General Nature of the Survey Area

Soil is intimately associated with its environment. The interaction of all factors determines the overall behavior of a soil for a given use. This section discusses briefly the major factors of the environment other than those that affect the use and management of soils. The factors discussed are climate; transportation, markets, and farming; water supply; and physiography and drainage.

Climate

This section was prepared by James T. Bradley, climatologist for Florida, National Weather Service, U.S. Department of Commerce. For convenience in presentation this section includes climate data for all of Broward County.

The climate of Broward County, Eastern Part, is characterized by long, warm, humid summers and mild winters and is considered one of the most important natural resources of the county. The moderating influence of the waters of the Atlantic on maximum temperatures in summer and minimum temperatures in winter is quite strong along the immediate coast but diminishes noticeably a few miles inland. The moderation of the coastal winter temperatures gives this section of the survey area a tropical climate (temperatures of coldest month higher than 64.4° F), while the rest is designated as humid subtropical.

Rainfall also has a much greater variation in an east-west direction than it has in a north-south direction. Precipitation occurs during all seasons, but on the basis of mean monthly totals of precipitation, a rainy season of 5 months from June through October brings nearly 65 percent of the annual rainfall and a relatively dry season of 5 months from November through March produces only about 20 percent of the annual total. Average annual rainfall totals range from 60 inches along the coastal sections to nearly 64 inches a few miles inland, and then diminish to 50 inches along the western border of Broward County.

Most summer rainfall comes from showers and thunderstorms of short duration. They are sometimes heavy, with 2 or 3 inches of rain falling within a period of

1 to 2 hours. Daylong rains in summer are rare, and when they occur, they are almost always associated with tropical storms. Winter and spring rains are not generally so intense as summer thundershowers. A 24-hour rainfall of almost 9 inches may be expected to occur sometime during the year in about 1 year in 10 on the average.

Hail falls occasionally during thunderstorms, but the hailstones are generally small and seldom cause much damage. Fourteen tornadoes were reported in Broward County during the 12-year period 1959-71.

Temperature and precipitation data for the period 1962-71 are shown in table 1. The data recorded at the Fort Lauderdale Experiment Station are representative of weather conditions in the eastern part of Broward County, but away from the immediate influences of the Atlantic. Table 2 gives a comparison with other weather stations within Broward County. The Experiment Station is located 5 miles southwest of the Fort Lauderdale Post Office, and the Dixie Water Plant is within the city limits, 2 miles southwest of the Post Office. The Bahia Mar observations are taken at the Yacht Club on the ocean, 3 miles east of the Post Office. North New River Canal No. 2 is a weather station that collects rainfall data only. It is located on the northern border of the county, midway between the eastern and western borders.

Summer temperatures have few day-to-day variations, and temperatures as high as 98° F are rare. In 45 years of record at the Dixie Water Plant, only one reading of 100° has been recorded. Twenty years of observation show a record high of 98° at the Experiment Station and 96° at Bahia Mar.

Winter minimum temperatures have considerable day-to-day variations due largely to periodic invasions of cold, dry air that has moved southward from Canada. At the Experiment Station, temperatures of 32° or below have been observed on only 11 days during the past 10 years. In 3 of the 10 years, no freezing temperatures have been observed. Data from stations run by the Federal-State Frost Warning Service show that in the 30-year period 1937-67, there were 25 nights on which the temperatures reached 32° or below along the coast, and 75 nights inland along the western edge of Broward County. Calculations show that in the same period there were 100 hours with temperatures of 32° or below along the coast, increasing to 300 hours inland. The lowest temperature reported in the Fort Lauderdale area during the last 45 years was 28°. Table 3 gives the record of low temperatures at Davie, a Frost Warning Station located in the interior southeastern section of Broward County. This temperature record can be considered representative of the climate for truck farming in the eastern sections of the survey area.

Tropical storms bring hazardous conditions at irregular intervals. On the average, hurricane-force winds occur 1 year in 7.

The prevailing wind direction is southeasterly from March through September and northwesterly to easterly for the other months. Wind velocity generally ranges from 12 to 20 miles per hour during the day and usually drops below 10 miles per hour at night. The average relative humidity ranges from about 87 percent early in the morning to about 60 percent early in the afternoon.

Transportation, Markets, and Farming

Broward County, Eastern Part, is served by several major highways. U.S. Highway 1 is in the eastern part of the area, U.S. Highway 441 in the central part, and U.S. Highway 27 in the western part. These highways run north-south. The Florida Sunshine State Parkway also runs north-south through the area. Numerous roads run east-west, but the most important is State Route 84, which connects Fort Lauderdale with Naples on the west coast. State Route 84 and U.S. Highway 27 are the only roads that go through the Everglades from the survey area.

Rail service is provided by the Florida East Coast Railroad and the Seaboard Coast Line Railroad. Both run north and south.

Transportation by water is available through Port Everglades. This port can accommodate large ships.

Four airports are available—Fort Lauderdale-Hollywood International Airport, Fort Lauderdale Executive Airport, Pompano Beach Airport, and North Perry Airport. Only Fort Lauderdale International Airport has scheduled commercial airline flights. The other airports are mostly for private planes.

The largest state owned fresh vegetable market in Florida is the Pompano State Farmers' Market. This market handles vegetables from the survey area and from the southern part of Palm Beach County. Most of the citrus is processed in other counties. More grapefruit is consumed than is produced in the county.

Not much farming was practiced in Broward County before 1910. Drainage was established with the formation of the Napoleon B. Broward Drainage District. After drainage was established, citrus groves were planted between the New River and South New River Canals. Most of the winter vegetable crops were grown in the same area, but planting soon spread primarily to the north as the area was developed (*9*). According to the 1950 Census of Agriculture, approximately 700 farms and 45 dairies were in Broward County in 1950. By 1969, the number had decreased to 291 farms and 8 dairies. Farming in the survey area generally is still on the decrease.

This is one of the few places in the United States that has either a tropical or humid subtropical climate. A large percentage of the soils are nearly level, poorly drained, and infertile. Another fairly large group of soils are organic and nearly level, very poorly drained, and relatively fertile. If drained and properly fertilized, all of these soils produce excellent winter truck crops.

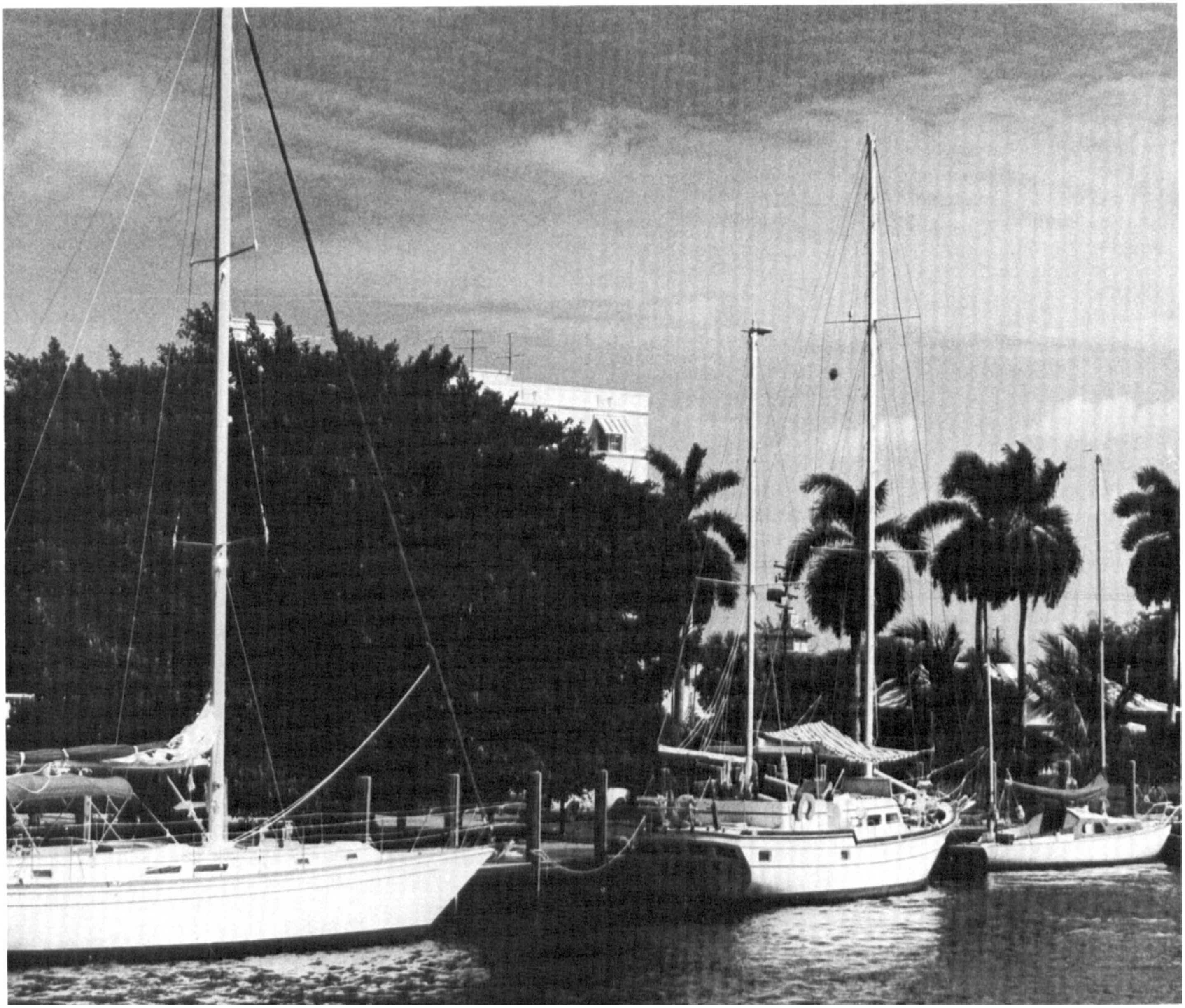

Figure 1.—The New River is an important docking area for pleasure craft in Ft. Lauderdale. The land area is part of the Immokalee, limestone substratum-Urban land complex.

The coastal areas have excellent facilities for fishing and boating (fig. 1).

Water Supply

The water supply for the cities in the survey area comes primarily from municipal wells. Many private wells are used, mostly for watering lawns. Because porous limestone is below most of the soils, water can move laterally for long distances. The water in the canals can be regulated to help recharge the ground water during dry periods.

Although most of the survey area receives about 60 inches of rainfall annually, this amount may not be sufficient to provide water needs in the future. The main alternate source could be Lake Okeechobee to the north of the survey area.

Physiography and Drainage

Broward County, Eastern Part, can be divided into three general regions based on differences in physiography and soils.

The western part is a nearly level, generally treeless sawgrass plain that appears to be flat. The soils are organic and overlie limestone. In many places the soils are shallow. Under natural conditions, water stood on these soils for months and only during extremely dry seasons was the surface exposed. Today, these soils have been drained, and water stands on the surface for only short periods. With drainage, the organic soils are subject to oxidation and subsidence. When exposed to air, organic matter is oxidized or slowly decomposed, and this gradual loss of organic matter results in subsidence or a lowering of surface elevation. Also, during dry seasons, wildfires have burned some of the organic surface soil and decreased the thickness of the organic material.

Very little acreage of the organic soils is farmed at present. A few acres are in improved pasture. In recent years, after some drainage, several types of trees have become established. These trees are melaleuca, Australian pine, and waxmyrtle. One method used for developing the organic soils for urban use removes the organic material and adds fill consisting of rock or sand.

The central part of the survey area consists of nearly level, grassy areas interspersed with small ponds. The soils here are wet and sandy and are underlain by limestone. Before drainage, water stood on these soils for several months each year. The original vegetation was water-tolerant grasses and a few cypress stands. In the higher areas, pine and palmetto were common. These areas are now farmed and produce excellent pasture and truck crops.

The central part is also an area of rapid urban development. The underlying limestone is mostly porous, and water moves through it laterally for long distances. Water-control ditches can be farther apart in these soils than in soils underlain by sand or loamy material. For urban development, fill is commonly added to raise the elevation to such a level that water does not cover the soil surface.

The eastern part of the survey area is made up of low, sandy ridges, a part of which is commonly referred to as flatwoods. The vegetation is mostly pine, palmetto, and native grasses. The flatwoods part is made up of deep, poorly drained, nearly level, sandy soils. These soils have been used mostly for truck crops and pasture, but are rapidly being developed for urban uses. They require drainage, and fill is added to low areas so that the entire acreage can be developed. The other part is made up of deep, excessively drained or well drained, sandy soils, many of which have been developed for urban uses.

The major drainage systems in the survey area flow from west to east and drain into the Atlantic Ocean. These systems are the Hillsboro Canal at the Palm Beach-Broward County line, the Pompano Canal at Margate, the Midriver Canal at Lauderhill, the North New River Canal at Davie, and C-9 at the Dade County line. These canals are under the control of the South Florida Water Management District.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or association, on the general soil map is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their suitability for major land uses. Table 4 shows the extent of the associations shown on the general soil map. It lists the suitability of each, in relation to that of the other associations, for agricultural uses and shows soil properties that limit use. The suitability ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used. The table also lists for each association the degree and kind of soil limitations for urban uses and for recreation uses.

Each map unit is rated for *citrus, vegetables, improved pasture, urban uses,* and *recreation areas.* Urban uses include residential, commercial, and industrial developments. Recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic.

Descriptions of Associations

Soils of the coastal ridges

The two associations in this group consist of nearly level to sloping, dominantly excessively drained soils. All of the soils are sandy throughout. Most of the soils along the Atlantic Coastal Ridge on the mainland have a yellow subsoil. All of the soils on the offshore island, including the wave-washed beaches, are a mixture of sand and fine shell fragments.

1. Paola-Urban land-St. Lucie Association

Excessively drained, nearly level, sandy soils that are more than 80 inches deep; large areas have been modified for urban use

In this association the landscape consists of knolls and ridges that are part of the Atlantic Coastal Ridge. Most of the acreage of this association is in the northeastern part of the survey area. Very little natural vegetation remains, except in the vicinity of Pompano Beach and Deerfield. What remains is sand pine and scrub oak and an undergrowth of native grasses, cacti, and, in places, some sawpalmetto.

This association makes up about 2.7 percent of the survey area. About 50 percent of the association is Paola soils and Urban land, about 11 percent is St. Lucie soils, and about 39 percent is minor soils.

Paola soils are excessively drained and nearly level. Typically they have a thin surface layer of gray fine sand, a subsurface layer of white fine sand, and a subsoil of yellow fine sand. These soils are more than 80 inches deep. Most of them have been modified by grading and shaping or otherwise generally altered for community or urban development.

Urban land consists of areas that are more than 70 percent covered by houses, streets, driveways, buildings, parking lots, and other structures. Consequently, the natural soil in these areas is not readily observable.

St. Lucie soils are excessively drained and nearly level. Typically they have a thin surface layer of gray fine sand that overlies white fine sand, which extends to a depth of more than 80 inches.

The minor soils in this association are Duette, Immokalee, Pomello, and Basinger soils. Most of these soils have been modified by grading and shaping or otherwise generally altered.

Much of the acreage of this association is used for homes, airports, and related urban purposes. Farming has no importance because of extensive urban development; and at any rate, the major soils generally are not suited or are poorly suited to most kinds of farming.

The soils of this association have slight limitations for most nonfarm uses. The sandiness of the major soils severely limits their use as sites for structures designed to hold water.

2. Palm Beach-Urban land-Beaches Association

Excessively drained, nearly level to sloping, deep, sandy soils that have fine shell fragments throughout, and Beaches; most areas have been modified for urban use

This association makes up most of the barrier island that extends along the coastline and is broken only by the Hillsboro Inlet and Port Everglades. It is on a long, narrow ridge that slopes abruptly towards the beach and more gently towards the Intracoastal Waterway. The natural vegetation, where it remains, consists of seagrape, cabbage palm, sawpalmetto, scrub oak and other oak species, sea-oats, railroad vine, beach sun flower and other shrubs, vines, and grasses. Coastal hammocks occur in a few places and have live oak, cabbage palm, strangler fig, and a variety of subtropical hardwoods, shrubs, and vines.

This association makes up about 1.4 percent of the survey area. About 60 percent of the association is Palm Beach soils and Urban land, about 14 percent is Beaches, and about 26 percent is minor soils.

Palm Beach soils are excessively drained and nearly level to sloping. Typically they have a thin, black, sandy surface layer over a thin, very dark grayish brown, sandy subsurface layer. Below this, mixed sand and multicolored shell fragments extend to a depth of more than 80 inches. Most of these soils have been modified by grading or shaping or otherwise generally altered for community development.

Urban land consists of areas that are more than 70 percent covered by houses, streets, parking lots, buildings, and other structures. Consequently, the natural soil in these areas is not readily observable.

Beaches are nearly level to sloping, narrow sandy strips along the ocean shoreline. They consist of sand and shell fragments that are constantly overwashed and reworked by wave action.

The minor soils in this association are primarily Canaveral soils and Arents. Most of these soils have been modified by grading or shaping or otherwise generally altered for urban uses.

Most of the acreage of this association is being used for homes, condominimums, shopping centers, and other urban and recreational purposes. Some areas from Dania Beach to south of Deerfield Beach remain in natural vegetation.

Farming has no importance in this association because of extensive urban development. In addition, the major soils are generally unsuited or are poorly suited to most agricultural uses.

The soils of this association have slight limitations for most urban uses. Their favorable location near the ocean and lack of wetness make them highly desirable for homesites. These sandy soils are severely limited for use as sites for structures designed to hold water. The side slopes of excavations in these soils are unstable and must be shored.

Soils of the low ridges, knolls, and flatwoods

The four associations in this group consist of nearly level, well drained, sandy soils over soft limestone at variable depths; nearly level, moderately well drained, sandy soils that have a dark, sandy subsoil below 50 inches; and nearly level, poorly drained, sandy soils that have a dark, sandy subsoil above 50 inches, which is underlain by soft limestone in some areas. These associations are entirely in the eastern half of the survey area, where they make up the major part of the land area.

3. Dade-Urban land Association

Well drained, nearly level, sandy soils that vary greatly in depth to soft limestone, generally between 20 and 40 inches; most areas have been modified for urban use

In this association the landscape is made up of the coastal ridge south of Middle River and other broad, slightly elevated areas separated by broad low sloughs and drainageways. This association occurs only in the southeastern part of the survey area. The natural vegetation, where it remains, is slash pine, live and laurel oak, scrub live oak, sawpalmetto, low cycads, pineland threeawn and other grasses.

This association makes up about 5.3 percent of the survey area. It is about 70 percent Dade soils and Urban land, and about 30 percent minor soils.

Dade soils are well drained and nearly level. They are sandy throughout and typically have a dark gray surface layer about 6 inches thick. The subsurface layer is white and light gray and extends to a depth of about 27 inches. The subsoil is reddish brown in the upper 5 inches and brown in the lower 3 inches. Soft limestone is at a depth of about 35 inches, but depth to the limestone is highly variable within short distances.

Urban land consists of areas that are more than 70 percent covered by houses, streets, driveways, buildings, parking lots and other structures. Consequently, the natural soil in these areas is not readily observable.

The minor soils in this association are primarily Arents. Other minor soils are Basinger, Duette, Immokalee, and Margate soils. Most of the latter soils, except Duette, have been modified for urban development by spreading sandy fill material over the surface to an average thickness of about 12 inches.

Most of the acreage of this association is used for homes, large buildings, shopping centers, golf courses, and related urban uses. Natural vegetation remains only in small areas scattered throughout the association. Farming is of no importance because of the extensive urban development, but there are numerous nurseries that produce plants for landscaping.

The soils of this association have slight limitations for most urban uses. These sandy soils are severely limited, however, for use as sites for structures designed to hold water.

4. Duette-Urban land-Pomello Association

Moderately well drained, nearly level and gently sloping, sandy soils that have a dark subsoil generally more than 50 inches deep; most areas have been modified for urban use

This association takes in slightly elevated broad knolls and ridges in the eastern part of the survey area. It also takes in the narrow ridge that makes up Pine Island, west of Davie. The natural vegetation, where it remains, is slash pine, sand pine, laurel oak, scrub oak, sawpalmetto, pineland threeawn, and other grasses.

This association makes up about 3.2 percent of the survey area. It is about 75 percent Duette soils and Urban land, about 10 percent Pomello soils, and 15 percent minor soils.

Duette soils are moderately well drained and nearly level. They are sandy throughout and typically have a very dark gray surface layer about 3 inches thick. The subsurface layer is white and 47 inches thick. The subsoil extends to a depth of more than 80 inches. The upper 15 inches is light brownish gray, and the lower part is black. Sand grains in the lower part are well coated with organic matter. Most of these soils have been modified for urban development by spreading a thin layer of gravelly sand over the surface to give it greater stability.

Urban land consists of areas that are more than 70 percent covered by houses, buildings, shopping centers, streets, parking lots and similar structures. Consequently, the natural soil in these areas is not readily observable.

Pomello soils are moderately well drained and nearly level and gently sloping. They are sandy throughout and typically have a dark gray surface layer about 5 inches thick. The subsurface layer extends to a depth of about 38 inches. The upper 3 inches is light gray, and the rest is white. The subsoil extends to a depth of 80 inches or more. The upper 14 inches is black, and the rest is dark reddish brown. Most of these soils have been modified for urban development, but some of the soils on Pine Island are in citrus groves or remain in natural vegetation.

The minor soils in this association are Dade, Immokalee, and St. Lucie soils. Some of these soils have been modified for urban development by spreading a layer of fill material over the surface.

Most of the acreage of this association is used for homes, large buildings, shopping centers, golf courses, and related urban uses. Natural vegetation remains only in a few areas in this association. Farming is of little importance because of the extensive urban development and because the major soils are droughty and poorly suited to most kinds of farming.

The soils of this association have moderate to severe limitations for sanitary facilities, excavations, and below-ground installations. Wetness, unstable side slopes of excavations, and rapid permeability are limitations requiring special measures to overcome. Limitations to the development of homes, roads, and small buildings are slight to moderate.

5. Immokalee-Urban land-Pompano Association

Poorly drained, nearly level, sandy soils that are more than 80 inches deep; most have a dark, organic coated subsoil; some areas have been modified for urban use

In this association the landscape is made up of broad, low ridges interspersed with sloughs and broad flats. This association is in the eastern part of the survey area. The natural vegetation, where it remains, is either slash pine, sawpalmetto, and native grasses, or pepper, slash pine, guava trees, and native grasses.

This association makes up about 14 percent of the survey area. It is about 62 percent Immokalee soils and Urban land, 8 percent Pompano soils, and 30 percent minor soils.

Immokalee soils are poorly drained and nearly level. They are sandy throughout and typically have a dark gray surface layer, a light gray subsurface layer, and a dark, organic coated subsoil that begins at a depth of more than 30 inches. These soils are more than 80 inches deep. They have been disturbed or modified in most places by sandy materials spread on the surface to an average thickness of about 12 inches.

Urban land consists of areas that are 70 to more than 75 percent covered by houses, shopping centers, parking lots, large buildings, and streets and sidewalks. Consequently, the natural soil in these areas is not readily observable.

Pompano soils are poorly drained and nearly level. Typically they have a surface layer of gray fine sand mixed with organic matter. Light colored fine sand extends below this to a depth of 80 inches or more.

The minor soils in this association are Basinger, Sanibel, Plantation, and Margate soils. Some of the minor soils also have been altered or filled.

Much of this association is used for homes, large buildings, shopping centers, and related urban uses. Most of the natural vegetation has been removed. Farming is of no importance because of the extensive urban development. Drainage and water control have been established over most of the association and help to reduce the wetness limitation for most nonfarm uses. In undeveloped areas that do not have adequate water control, wetness is a limitation of the soils for most uses, and in some places flooding is a hazard.

6. Immokalee-Urban land Association

Poorly drained, nearly level, sandy soils that have a dark subsoil that is underlain by limestone at a depth of more *than 40 inches; most areas have been modified for urban use*

In this association the landscape is made up of broad, low ridges interspersed with grassy sloughs. This association occurs in the southeastern part of the survey area. The natural vegetation, where it remains, consists of slash pine, laurel oak, sawpalmetto, waxmyrtle, pineland threeawn, and other grasses.

This association makes up about 3.5 percent of the survey area. It is about 65 percent Immokalee soils and Urban land, and 35 percent minor soils.

The Immokalee soils in this association are poorly drained and nearly level. They are sandy throughout and typically have a very dark gray surface layer about 5 inches thick. The subsurface layer is light gray and white and extends to a depth of about 48 inches. The subsoil is black and about 10 inches thick. In this layer the sand grains are well coated with organic matter. At a depth of about 58 inches is soft, porous limestone with solution holes filled with sand and rock fragments. These soils have been modified in most places by sandy material spread on the surface to an average thickness of about 12 inches.

Urban land consists of areas that are 70 to 75 percent or more covered by houses, shopping centers, parking lots, large buildings, streets, and sidewalks. Consequently, the natural soil in these areas is not readily observable.

The minor soils in this association are Immokalee soils that are not underlain by limestone and Basinger, Margate, Pompano, and Sanibel soils. In most areas, the minor soils have been modified for urban uses by fill material spread on the surface.

Much of this association is used for homes, buildings, shopping centers, and related urban uses. Most of the natural vegetation has been removed. Farming is of no importance because of the extensive urban development. Drainage and water control have been established in most areas of this association and help to reduce the wetness limitation for most urban uses. In undeveloped areas that do not have adequate water control, wetness is a limitation for all uses. Filling with suitable soil material to raise the site above natural ground level will help to overcome this limitation.

Soils of the low flatwoods, sloughs, and marshes

The two associations in this group consist of nearly level, poorly drained and very poorly drained soils. Some of these soils are sandy throughout, and others are made up entirely of organic materials. All of these soils are underlain by limestone. These associations cover all of the western half of the survey area and occur in drainageways dissecting the eastern part in several places.

7. Hallandale-Margate Association

Poorly drained, nearly level, sandy soils that are less than 60 inches deep to hard limestone

This association consists of soils on broad flats and low terraces interspersed with drainageways and ponds or depressions. It is east of the Everglades and west of the Atlantic Coastal Ridge. The natural vegetation is native grasses, sawpalmetto, waxmyrtle, and a few slash pine and cypress trees. Cypress trees are common in the drainageways and depressions.

This association makes up about 39.2 percent of the survey area. About 35 percent of the association is Hallandale soils, about 30 percent is Margate soils, and about 35 percent is soils and miscellaneous areas of minor extent.

Hallandale soils are poorly drained and nearly level. Typically they have a thin surface layer of black fine sand, a subsurface layer of light brownish gray fine sand, and a subsoil of brown and yellowish brown fine sand that has slightly more clay than the subsurface layer. Beneath the subsoil is hard limestone. Depth to hard limestone ranges from 7 to 20 inches but is typically 16 inches.

Margate soils are poorly drained and nearly level. Typically they have a surface layer of very dark gray fine sand and a subsurface layer of light brownish gray fine sand. The subsoil is brown fine sand that is slightly more clayey than the subsurface layer. It has a layer, about 4 inches thick, of brown fine sandy loam mixed with fragments of limestone. Hard limestone is at a depth of about 32 inches. Depth to hard limestone ranges from 20 to 40 inches.

Of minor extent in this association are areas of Dania, Lauderhill, and Sanibel soils and areas of Urban land. Also of minor extent are areas of Hallandale and Margate soils that have been modified by grading, shaping, and filling.

Much of the acreage of this association is used for improved pasture (fig. 2) or is in natural vegetation. A few areas are used for truck crops. Urban development is rapidly encroaching upon this association; consequently, farming has diminishing importance. Drainage and water control have been established over most of the association. The major soils are poorly suited to cultivated crops.

The soils of this association are severely limited for most nonfarm uses. Because of wetness, water control is necessary for most uses, and commonly fill material has to be added to the surface of the soil to make areas higher for use as building sites. The hard limestone provides an excellent base for foundations.

8. Lauderhill-Dania Association

Very poorly drained, nearly level, organic soils that are less than 40 inches deep to hard limestone

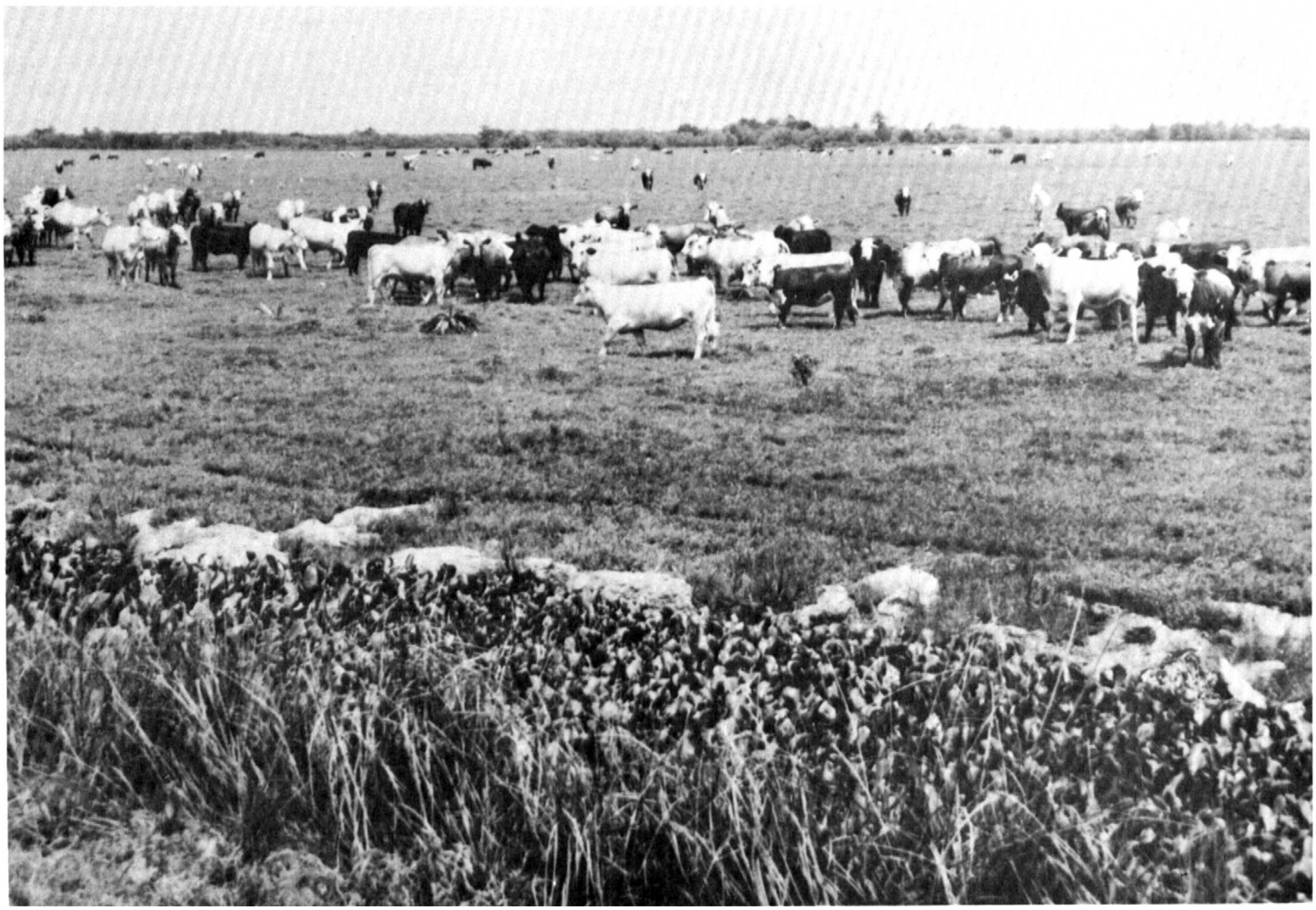

Figure 2.—Typical area of improved grass pasture in the Hallandale-Margate association. The soil is Margate fine sand. Limestone is exposed on the bank of the drainage ditch in the foreground.

This association is made up of soils on broad flats. It is mostly in the western part of the survey area and the eastern part of the Everglades. The natural vegetation is mainly sawgrass; and where the sawgrass has been burned, melaleuca trees have become established (fig. 3).

This association makes up about 24.4 percent of the survey area. It is about 52 percent Lauderhill soils, 23 percent Dania soils, and 25 percent minor soils.

Lauderhill soils are very poorly drained and nearly level. Typically they have a surface layer of black muck (sapric material). Below this is dark reddish brown muck; and hard limestone is at a depth of about 31 inches. Depth to hard limestone varies from 20 to 40 inches.

Dania soils are very poorly drained and nearly level. Typically they have a surface layer of black muck (sapric material). Below this is dark reddish brown muck; a thin layer of brown fine sand; and a thin layer of light gray, sandy marl mixed with limestone fragments. Hard limestone is at a depth of about 18 inches. Depth to hard limestone varies from 14 to 20 inches.

The minor soils in this association are the Plantation and Sanibel soils.

Most of this association is still in its natural vegetation. Several small areas are in improved pasture and some sod farms. With adequate drainage and water control, the soils are well suited to farming. For community development or other nonfarm uses, wetness and organic material are limitations. The organic material has low strength and is subject to oxidation and subsidence when not saturated with water. For houses or other urban developments, the organic material needs to be removed and replaced by fill (fig. 4).

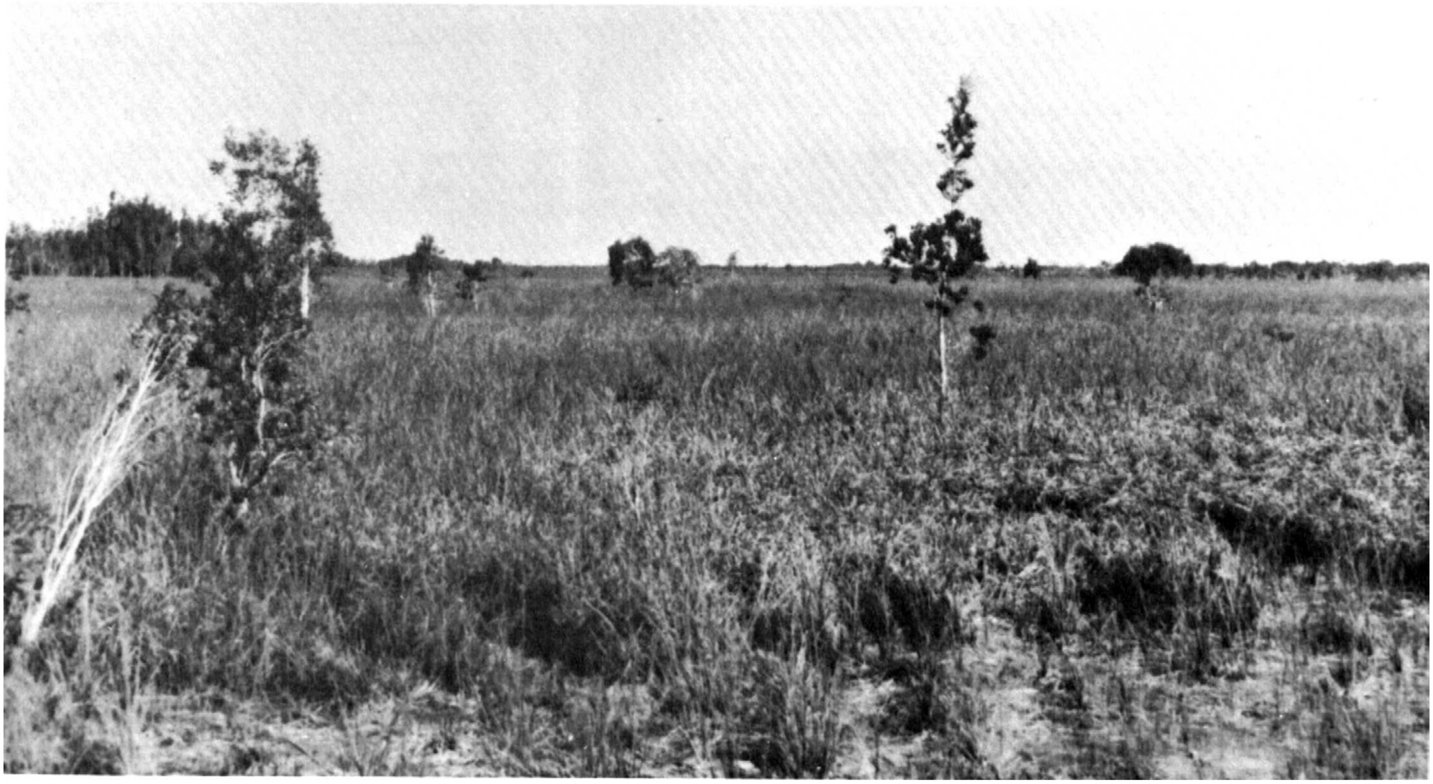

Figure 3.—Area of sawgrass and scattered malaleuca trees in the Lauderhill-Dania association. The soil is Dania muck.

Soils of the coastal lowlands and tidal swamps

The two associations in this group are dominated by soils formed by man and machinery. Some of these soils consist of sandy fill material spread over natural sandy or organic soils. Others consist of gravelly fill material spread over natural marl soils that are underlain by limestone. Some tidal areas south of Port Everglades consist of the natural marl soils resting on limestone.

9. Udorthents-Urban land-Pennsuco Association

Soils that have been modified by spreading mixed limestone fragments, sand, and shell fill material over the natural surface, Urban land, and very poorly drained, loamy soils underlain by limestone; in swamps and lowlands

This association takes in coastal lowlands and swamps. It occurs in the southeastern part of the county and extends from Port Everglades south to the county line. The natural vegetation consists of bushy sea-oxeye, glasswort, ferns, sedges, and sawgrass and other tall grasses. Scattered cabbage palms are in some areas. In swamp areas the vegetation is dominantly mangrove trees with giant leather fern in places.

This association makes up about 3 percent of the survey area. About 45 percent is Udorthents and Urban land, about 25 percent is Pennsuco soils, and about 30 percent is minor soils.

The Udorthents in this association consist of about 20 to 50 inches of mixed limestone fragments, sand, and shell fill material spread over the natural soils, which were mostly Perrine or Pennsuco soils. The water table in these soils is generally near the base of the fill material.

Most of the Udorthents have been developed for urban uses and are intermingled with Urban land. Urban land is covered by streets, sidewalks, parking lots, and buildings and other sructures that so obscure the soil that identification of the soil is not feasible.

Pennsuco soils are very poorly drained. They are made up of thick layers of calcareous silt loam or silty clay loam (marl) of variable color that are underlain by limestone at a depth of more than 40 inches. A layer of muck or sand may be present above the limestone.

The minor soils in this association are Perrine, Perrine Variant, and Terra Ceia soils. Some areas of these minor soils have been filled or otherwise generally altered for urban development.

Much of this association is used for homes, large buildings, commercial centers, and related urban uses. Most of the natural vegetation has been removed, but there are several large areas of mangrove swamp

Figure 4.—Trailer park development in an area of the Lauderhill-Dania association. The soils are Lauderhill muck and Dania muck. Organic material is being removed and replaced by fill. A high water table limits these soils for septic tanks.

remaining, and these areas are subject to flooding. Farming is of little importance because of the extensive urban development, but a few hundred acres is still being used for truck and nursery crops. Drainage ditches and fill have helped to overcome the wetness limitation for most nonfarm uses.

10. Arents-Urban land Association

Soils that have been modified for urban use by spreading sandy fill material over the natural soil surface, and Urban land; in low coastal areas

This association is made up of soils that have been filled, graded, and shaped for urban development. It is in the eastern part of the survey area and north of Port Everglades, where the natural soils have been extensively modified by excavation for canals and open water areas and filling in of adjacent areas. There is little natural vegetation.

This association makes up about 3.3 percent of the survey area. About 85 percent of the association is Arents and Urban land, and about 15 percent is minor soils.

Generally, Arents are nearly level and somewhat poorly drained to moderately well drained. The surface layer is commonly a mixture of brownish sand and limestone fragments. It is 8 to 10 inches thick, and the upper 4 inches or so may be mostly black, sandy topsoil material that has been applied for landscaping. The subsurface layer extends to a depth of about 32 inches. It is a variable mixture of brownish and grayish sands with lenses and pockets of black sand, mucky sand, or muck, and, in some places, weakly cemented fragments of black or dark reddish brown sand. Below this is the natural soil, which in most areas is sandy, but in some areas is muck over sand or is dominantly muck. Because Arents were created for urban development, they are intricately mixed with Urban land.

Urban land is covered by streets, sidewalks, parking lots, and buildings and other structures that so obscure the soil that identification of the soil is not feasible.

The minor soils in this association are Basinger, Canaveral, Immokalee, Okeelanta, and Sanibel soils. Some areas of these minor soils have been partly filled or otherwise generally altered for urban development.

Almost all of this association is used for urban or recreational purposes. A few small areas of mangrove swamp remain along the Intracoastal Waterway, and one large area remains in Hugh Taylor Birch State Park. Farming is of no importance because of the extensive urban development. Established drainage and filling have helped to overcome the wetness limitation for most nonfarm uses. Arents that overlie organic material are severely limited for roads and buildings. The organic material is compressible and will not support mobile or static loads. This limitation can be overcome by excavating the organic material and replacing it with stable fill material, or by constructing foundations on pilings.

Soil Descriptions

This section describes the soil series and the detailed soil map units in Broward County, Florida, Eastern Part. Each soil series is described in detail, and then, briefly, each map unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the map units in that series. Thus, to get full information about any one map unit, it is necessary to read both the description of the map unit and the description of the soil series to which it belongs.

A soil series is made up of all soils that have profiles that are almost alike. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The detailed description follows standards in the Soil Survey Manual (*5*). Many of the technical terms used in the description are defined in Soil Taxonomy (*7*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The profile described for the series is typical of the map units in that series. If the profile of a given map unit is different from the one described for the series, these differences are stated in describing the map unit or they are differences that are apparent in the name of the map unit.

Each series description is followed by a description of one or more detailed soil map units. Each map unit represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Immokalee fine sand is a phase in the Immokalee series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils and miscellaneous area are somewhat similar in all areas. Paola-Urban land complex is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Hallandale and Margate soils is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Not all map units are members of a soil series. Udorthents, for example, do not belong to a soil series, but nevertheless they are listed in alphabetic order along with the series.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Beaches is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Arents

Arents are nearly level or gently sloping soils made up of heterogeneous overburden material that has been removed from areas of other soils and used primarily for land leveling, as fill, or as final cover for sanitary landfill. This material is mixed sand or fine sand and fragments from the subsoil of the soil from which the Arents were removed. Arents are scattered throughout the survey area, but areas of Arents are quite extensive along the Intracoastal Waterway.

In many areas, the upper 4 inches is a black mixture of sand and organic matter that has been spread over the surface as topsoil to support plant growth. Below this to a depth of about 32 inches is a variable mixture of pale brown and dark brown sand that has discontinuous lenses and pockets of black sand and occasional fragments of weakly cemented, dark reddish brown sand. The upper 8 to 10 inches of this layer has some gravel and cobblestones that help to stabilize the loose, sandy surface material. Below a depth of 32 inches is the original soil, which generally has the profile of a Basinger soil, an Immokalee soil, or a wet sandy or organic soil common to swampy areas. In some places, this underlying soil has been truncated and mixed with the overburden material.

Permeability and available water capacity are variable, but permeability is generally rapid and available water capacity is generally low or very low. Natural fertility and organic matter content are low. The water table fluctuates between depths of 20 and 50 inches most of each year and commonly is at the base of the overburden material.

Some areas of Arents are in spoil mounds along the Intracoastal Waterway. These areas generally have a dense growth of Australian pine and are idle. Most Arents were created in low coastal areas to make the land suitable for building sites or other urban purposes.

Reference pedon of Arents alongside a street in Ft. Lauderdale, about 1.0 mile north of Sunrise Boulevard, 1 block east of Bayview Drive and 1 long block west of the Intracoastal Waterway, SE1/4SE1/4SE1/4 sec. 25, T. 49 S., R. 42 E.:

A—0 to 4 inches; black (10YR 2/1) sand, mixed with gray sand; single grained; loose; common limerock fragments up to about 2 inches in diameter; slightly acid; clear smooth boundary.

C1—4 to 9 inches; pale brown (10YR 6/3) sand mixed with dark brown, gray, and white sand; single grained; loose; few rock fragments; slightly acid; irregular boundary.

C2—9 to 32 inches; dark brown (10YR 3/3) sand with black, gray, and white sand streaks and pockets; single grained; loose; few small dark reddish brown weakly cemented fragments; slightly acid; clear smooth boundary.

IIA—32 to 36 inches; black (10YR 2/1) sand; single grained; loose; neutral.

IIC—36 to 60 inches; light brownish gray (10YR 6/2) sand, common medium dark grayish brown (10YR 4/2) mottles; single grained; loose; streaks of black in old root channels; neutral.

Reaction ranges from medium acid to moderately alkaline. Texture of the overburden material is sand or fine sand with or without limerock fragments or shell fragments.

The IIA horizon is black to gray sand or fine sand. This layer is variable in thickness and is absent in many pedons.

The IIC horizon consists of the natural underlying soil, and its colors and texture depend on where the pedon is located.

In places, the buried soil is organic. It consists of black to dark reddish brown muck.

Ae—Arents-Urban land complex. This complex consists of Arents in open areas and of Urban land, or areas covered by concrete and buildings. About 50 to 70 percent is Arents, and about 30 to 50 percent is Urban land. The areas of these components are so intermixed or so small that to map them separately at the scale used was impractical. Slopes are 0 to 5 percent.

The Arents part of this map unit is in open areas that are used for lawns, vacant lots, parks, and playgrounds or are unused. Urban land consists of streets, sidewalks, parking lots, buildings, and other construction areas where the soil is covered and cannot be readily observed.

Arents are nearly level or gently sloping, somewhat poorly drained to moderately well drained, heterogeneous sandy materials about 20 to 50 inches thick that have been spread over the natural soils to make them suitable for urban development (fig. 5). The underlying natural soil can generally be identified in places where the overburden material is less than about 30 inches thick.

Depth to the water table depends on the established drainage in the area, but is generally between depths of 20 and 50 inches most of each year. The permeability is variable, but generally it is rapid. Available water capacity is generally low. Natural fertility and organic matter content are low.

Included with this complex in mapping are small areas in which the sandy overburden material rests on organic (muck) soils or on silt loam (marl) soils. In some areas, the overburden material has a high percentage of coarse rock fragments. Below a depth of 2 or 3 feet in a few areas are large cells of garbage and refuse, which range in thickness from 5 to 20 feet. These areas of sanitary landfill are identified on the soil map by the words

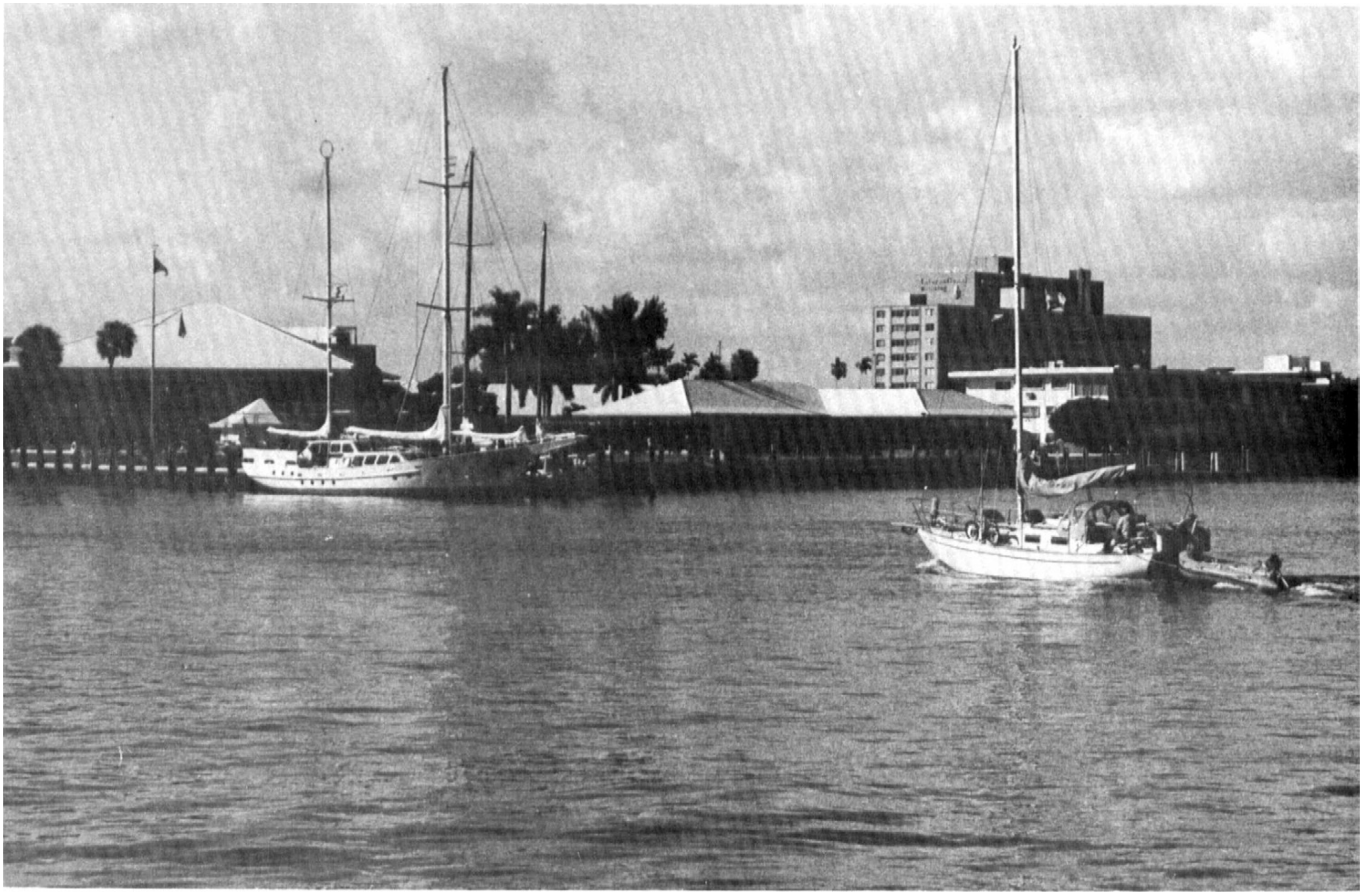

Figure 5.—Large areas of mangrove swamps have been completely altered for urban development and waterways. Soils in these areas are now mapped as Arents-Urban land complex.

"sanitary landfill" in addition to the map symbol. Also included in this map unit are small areas of Arents in spoil mounds or other idle areas that are not being urbanized or are not in close association with urban development.

Under proper management, which includes spreading a thin layer of good topsoil over the surface and timely applications of water and fertilizer, the commonly grown lawn grasses and ornamentals can be produced successfully on the soil.

The determined use of this map unit for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Ao—Arents, organic substratum-Urban land complex. This complex consists of Arents, organic substratum, in open areas and of Urban land, or areas covered by concrete and buildings. About 50 to 70 percent is Arents, organic substratum, and about 30 to 50 percent is Urban land. The areas of these components are so intermixed or so small that to map them separately at the scale used is impractical. Areas are nearly level.

Arents, organic substratum, are in open areas that are used for lawns, vacant lots, parks, and playgrounds, or are idle. Urban land consists of streets, sidewalks, parking lots, buildings, and other construction areas where the soil is covered and cannot be readily observed.

Most of the acreage of this map unit is in the eastern part of the survey area near the Intracoastal Waterway. Thickness and color of the layers of this soil vary from place to place, but in a representative profile, the upper 38 inches is very pale brown sand that has pockets, streaks, and lenses of gray and brown sand. About 15 to 20 percent of the upper 12 inches is made up of gravel and cobblestones that range to 2 or 3 inches in diameter. Between depths of 38 and 52 inches is black muck that contains lenses and pockets of dark reddish brown, fibrous muck. Dark grayish brown sand that has light gray and very pale brown mottles extends below the muck to a depth of 72 inches or more.

Included with this complex in mapping are small areas of soils that have a higher percentage of limestone fragments in the overburden material and scattered areas of soils that do not have organic layers in the underlying natural soil. Also included are scattered open areas that have not been developed for urban use at this time.

Depth to the water table depends on the established drainage in the area, but in most areas it is between 24 and 50 inches and averages about 40 inches. Permeability is rapid throughout these soils, though in some places the weight of the overburden has compressed the organic layer and reduced its permeability. Available water capacity is generally low in the overburden and very high in the underlying organic materials. The natural fertility is low.

Most of the Arents, organic substratum, part of this map unit is used for lawns and ornamentals. The soil is poorly suited to most plants, but satisfactory plant growth can be achieved by spreading a layer of good topsoil over the surface and applying water and fertilizer on a regular basis.

The soils in this complex are not used for crops or improved pasture. They were created to make the land suitable for urban development and are fairly well suited to many urban uses. They are severely limited for foundations for roads or buildings. The organic substratum material is compressible under mobile or static loads. The severity of the limitation varies according to the degree of drainage provided, the thickness of the overburden, and the thickness of the underlying organic material. For major roads, the organic material should be removed. All building foundations should be placed on pilings.

The determined use of this map unit for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Basinger Series

The Basinger series consists of nearly level, poorly drained soils in broad sloughs and flats. These soils formed in unconsolidated marine sediment. In most years the water table is at a depth of 10 inches or less for 2 to 6 months and between 10 and 40 inches for 6 months or more. In dry seasons it is below a depth of 40 inches for short periods. Under natural conditions these soils are covered by shallow water for 1 or 2 months each year; where drainage has been improved, however, they are not.

Typically, the surface layer is very dark grayish brown fine sand about 6 inches thick. The subsurface layer is about 11 inches of light gray fine sand. Underlying this to a depth of 60 inches is pale brown fine sand.

Permeability is very rapid in all layers of these soils. Available water capacity is very low to a depth of 23 inches, medium in the subsoil, and low in the substratum. Natural fertility and content of organic matter are low.

Where adequate water control and intensive management practices are in use, Basinger soils are suited to winter truck crops and improved pasture grasses.

Typical pedon of Basinger fine sand, about 50 feet west of University Drive and 0.9 mile north of Orange Drive, SE1/4SE1/4 sec. 21, T. 50 S., R. 41 E.:

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sand; single grained; loose; few fine roots; strongly acid; clear smooth boundary.

A21—6 to 13 inches; light gray (10YR 7/1) fine sand; streaks of very dark gray (10YR 3/1) in root channels; single grained; loose; strongly acid; gradual wavy boundary.

A22—13 to 17 inches; light gray (10YR 7/2) fine sand; single grained; loose; very strongly acid; gradual wavy boundary.

A3—17 to 23 inches; brown (10YR 5/3) fine sand; few medium distinct black (10YR 2/1) mottles in root channels; single grained; loose; some uncoated sand grains; sand grains turn white on ignition; very strongly acid; gradual wavy boundary.

C&Bh—23 to 35 inches; brown (10YR 4/3) fine sand; black (10YR 2/1) streaks in root channels; single grained; loose; some clean and some partly coated sand grains; strongly acid; gradual wavy boundary.

C—35 to 60 inches; pale brown (10YR 6/3) fine sand; single grained; loose; many uncoated sand grains; very strongly acid.

Basinger soils range from slightly acid to very strongly acid throughout.

The A1 horizon is black, very dark gray, dark gray, or very dark grayish brown and ranges from 2 to 8 inches in thickness. The A21 horizon is light brownish gray, gray, or light gray and is 5 to 18 inches thick. The A22 horizon is white, light gray, very pale brown, or light brownish gray and is 3 to 6 inches thick. The A3 horizon is brown or dark brown and is 2 to 8 inches thick.

The C&Bh horizon is brown, dark brown, or dark grayish brown and ranges from 6 to 18 inches in thickness. This horizon has a slight increase in clay content over the A2 horizon. The C horizon is brown or pale brown and extends to a depth of 60 inches or more.

Basinger soils are associated with Immokalee, Margate, and Pompano soils. They do not have the strong Bh horizon of Immokalee soils. They differ from Margate soils in not having limestone within a depth of

40 inches. They have a C&Bh horizon that is not present in Pompano soils.

Ba—Basinger fine sand. This is a nearly level, deep, poorly drained, sandy soil in broad sloughs and flats. Included in mapping are small areas of Immokalee fine sand, Pompano fine sand, and Margate fine sand.

Most of the acreage of this soil is in natural vegetation that consists of pepper trees, myrtle, pine, and native grasses. Scattered cypress trees are in lower areas.

This soil is severely limited for cultivated crops by wetness and other adverse properties. To grow any crops and pasture plants on this soil, a water-control system is needed that provides subsurface irrigation by controlling the water table. Truck crops, other specialized crops, and improved pasture consisting of a mixture of grass and clover can be grown with adequate water control and intensive management. This soil is severely limited for citrus. Where citrus is grown, very intensive management practices and adequate water control are needed. The soil responds well to applications of fertilizer and lime.

This soil is in capability subclass IVw in areas where drainage outlets are available and in capability subclass VIIw in areas where drainage outlets are not available.

Beaches

Be—Beaches. Beaches are nearly level to sloping, narrow, sandy strips along the Atlantic Ocean. Seawater regularly overwashes the larger part of the beaches at high tide, and these areas are barren. The slightly higher areas away from normal wave action are inundated only during seasonal and storm tides. These areas normally have only sparse vegetation that is fragile and easily destroyed. Some beaches change in width and shape every time a major storm occurs. Slopes are 0 to 8 percent.

Beaches are fine to coarse sand mixed with multicolored shells and shell fragments. This material is constantly reworked by wave action. Soil reaction is moderately alkaline, and shell fragments are calcareous.

Beaches are used extensively for swimming, sunbathing, strolling, fishing, and other recreational purposes. They have great esthetic value. Most beaches remain in their natural condition, but many beaches, especially those near urban developments, have been altered. Groins, jetties, and seawalls have been constructed to protect the beaches from erosion. Rocks and sandy fill material have been brought onto the beaches to control erosion or to extend the higher land on the beach ridge to nearer the water's edge, thus protecting homes or other buildings there.

Because of the unique location of Beaches and their value for recreation activities, other uses are not practical.

This miscellaneous area is not assigned to a capability subclass.

Boca Series

The Boca series consists of nearly level, poorly drained soils in low, broad, wet areas and along grassy, poorly defined drainageways. These soils formed in moderately thick beds of marine sandy and loamy sediment over limestone. In most years the water table is at a depth of 10 inches or less for 2 to 6 months, and between 10 and 30 inches for 6 months or more. During dry seasons it remains in cavities of the limestone. Under natural conditions, some areas of these soils are covered by shallow water 1 to 2 months each year. Where there is improved drainage, however, they are not.

Typically, the surface layer is dark gray fine sand about 7 inches thick. The subsurface layer is light gray fine sand about 6 inches thick. The subsoil is about 19 inches thick. The upper 12 inches of the subsoil is very pale brown fine sand mottled with brownish yellow and yellowish brown, and the lower 7 inches is grayish brown sandy clay loam mottled with yellowish brown. Below this is about 2 inches of white to yellowish brown marl, decomposed rock, sandy clay loam, and sand mixed with limestone fragments. Hard limestone that contains solution holes filled with sandy clay loam is at a depth of 34 inches.

Permeability is rapid in the sandy layers of these soils and moderate in the loamy part of the subsoil. Available water capacity is low in the surface layer, very low between depths of 7 and 25 inches, and medium in the loamy part of the subsoil. Natural fertility and content of organic matter are low.

Where adequate water control and intensive management practices are used, Boca soils are suited to most winter truck crops and improved pasture grasses.

Typical pedon of Boca fine sand, 0.25 mile south of State Road 827 and about 0.7 mile west of U.S. Highway 441, SW1/4SW1/4NW1/4 sec. 36, T. 48 S., R. 41 E.:

Ap—0 to 7 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many fine and medium roots; medium acid; clear wavy boundary.

A2—7 to 13 inches; light gray (10YR 7/1) fine sand; many medium distinct very dark gray (10YR 3/1) mottles; single grained; loose; medium acid; clear wavy boundary.

B1—13 to 25 inches; very pale brown (10YR 7/3) fine sand; few fine distinct, brownish yellow (10YR 6/6) and common fine distinct yellowish brown (10YR 5/4) mottles; single grained; loose; neutral; abrupt smooth boundary. This horizon has a slight increase in clay.

B2tg—25 to 32 inches; grayish brown (10YR 5/2) sandy clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; moderately alkaline; abrupt irregular boundary.

IIC—32 to 34 inches; white (10YR 8/1) to yellowish brown (10YR 5/8) decomposed rock, marl, sandy clay loam, and sand mixed with limestone fragments; massive in places; friable; moderately alkaline; abrupt irregular boundary.

IIIR—34 inches; hard fractured limestone. This horizon has two solution holes approximately 15 inches in diameter and extending from 40 to 82 inches below the surface. These holes contain sandy clay loam.

The A1 or Ap horizon is black, very dark gray, dark gray, very dark grayish brown, dark grayish brown, or grayish brown and ranges from 4 to 9 inches in thickness. Where the A1 or Ap horizon is black, very dark gray, or very dark grayish brown, it is less than 6 inches thick. The A2 horizon is grayish brown, dark grayish brown, light gray, or gray. Reaction is strongly acid to neutral. Total thickness of the A horizon is more than 20 inches unless a B1 horizon begins within this depth.

The B1 horizon, where present, is brown, pale brown, very pale brown, dark brown, yellowish brown, or light yellowish brown fine sand. This horizon has at least a 3 percent increase in clay content from the overlying horizon. The B1 horizon is 0 to 15 inches thick. Reaction ranges from strongly acid to neutral. In some places there are mottles in shades of brown, yellow, or gray.

The B2tg horizon is light brownish gray, grayish brown, dark grayish brown, gray, or dark gray sandy loam or sandy clay loam. It averages from 16 to 23 percent clay. In some places there are mottles in shades of gray, yellow, or brown. Reaction is neutral to moderately alkaline. This horizon is 3 to 7 inches thick.

The IIC horizon is decomposed rock, marl, sandy clay loam, and sand mixed with broken pieces of limerock. The color of this material is white to very dark gray and in places includes shades of yellowish brown. This horizon is 1 to 3 inches thick. Reaction is neutral to moderately alkaline.

Limestone is at a depth of 24 to 40 inches, and solution holes extend to a depth of 50 inches or more and are filled with sandy clay loam.

Boca soils are associated with Hallandale, Margate, and Plantation soils. They have a B2t horizon above the rock, whereas Margate and Hallandale soils do not. They do not have the organic surface layer of Plantation soils.

Bc—Boca fine sand. This is a nearly level, poorly drained, sandy soil underlain by limestone at a depth of 24 to 40 inches. It is in low, broad, wet areas and along grassy, poorly defined drainageways.

Included with this soil in mapping are small areas of Basinger fine sand, Margate fine sand, and Hallandale fine sand.

Most areas of this soil are in natural vegetation that consists of gallberry, sawpalmetto, cabbage palmetto, slash pine, and an understory of pineland threeawn. Some areas are used for truck crops, improved pasture, and citrus.

This soil is severely limited for cultivated crops by excessive wetness. To grow any crops and pasture plants on this soil, a water-control system is needed that provides subsurface irrigation by controlling the water table. Truck crops and improved pasture consisting of a mixture of grass and clover can be grown with adequate water control and intensive management that includes adequate fertilization and lime if needed. With very intensive management and adequate water control, citrus can be grown on this soil.

This soil is in capability subclass IIIw.

Canaveral Series

The Canaveral series consists of nearly level and gently sloping, moderately well drained to somewhat poorly drained soils on the barrier island along the coast. These soils formed in thick deposits of marine sands and shell fragments and are on gentle lower slopes on the western side of the narrow dunelike ridge. Under natural conditions, the water table is between depths of 12 and 36 inches most of each year, though in dry seasons it may drop to 60 inches. In the lowest areas adjacent to the Intracoastal Waterway, the height of the water table depends partly on tidal fluctuations.

Typically, the surface layer is very dark grayish brown sand about 6 inches thick. Between 6 and 50 inches is brown sand. Below this is light olive gray sand that extends to a depth of 80 inches or more. About 5 to 50 percent of the sand is derived from shell.

Permeability is very rapid in all layers of these soils. The available water capacity is very low. Natural fertility and organic matter content are also very low.

These soils are unsuited to cultivated crops or citrus. They are only fairly suited to improved pasture. Canaveral soils are in the part of the county highly valued for urban development and are well suited to most urban uses.

Typical pedon of Canaveral sand in a small wooded area along Highway A1A, about 150 feet east of the Intracoastal Waterway and about 0.35 mile north of the Hillsboro Inlet, SE1/4NE1/4SW1/4 sec. 20, T. 48 S., R. 43 E.:

A—0 to 6 inches; very dark grayish brown (10YR 3/2) sand; single grained; loose; common fine and medium roots; about 5 percent multicolored fine fragments of shell; moderately alkaline; calcareous; gradual wavy boundary.

C1—6 to 50 inches; brown (10YR 5/3) sand; single grained; loose; about 10 percent multicolored sand size fragments of shell; few small pockets or lumps of cemented fragments of shell in lower part; moderately alkaline; calcareous; clear smooth boundary.

C2—50 to 80 inches; light olive gray (5Y 6/2) sand; single grained; loose; about 40 to 50 percent sand size fragments of shell with little color; few pockets of strongly gleyed silt loam or silty clay loam marl; moderately alkaline; calcareous.

Reaction ranges from mildly to moderately alkaline in all layers. Shell fragments are calcareous. Texture is sand throughout, except in a few pedons that contain a discontinuous layer of fine sand or in pedons that contain discontinuous layers of almost pure shell and coarse fragments of shell.

The A horizon is black, very dark gray, very dark brown, very dark grayish brown, dark brown, dark gray, or dark grayish brown. Fragments of shell range from about 5 to 15 percent. Thickness of the A horizon ranges from 4 to 9 inches.

The C1 horizon is grayish brown, brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, light gray, or very pale brown. In some pedons, discontinuous lenses or pockets of loose shell and fragments of shell or cemented fragments of shell are in this horizon. Content of multicolored, sand size fragments of shell in the C1 horizon ranges from about 10 to 60 percent. Thickness of the horizon ranges from 30 to 60 inches or more.

The C2 horizon is gray or light olive gray. Pockets or lenses of almost pure shell, cemented fragments of shell, or marl are in some pedons.

Canaveral soils are associated with Arents and Palm Beach soils. Canaveral soils do not have fragments of diagnostic horizons that are in fill materials that make up Arents. They are less well drained than Palm Beach soils.

Ca—Canaveral-Urban land complex. This nearly level to gently sloping complex consists of 50 to 70 percent Canaveral soils and 30 to 50 percent Urban land. The areas of these components are so intermixed or so small that separation at the scale of mapping is impractical. The Canaveral soils are in open areas used for lawns, vacant lots, parks, and playgrounds. The Urban land part is covered by streets, sidewalks, parking lots, buildings, or other construction to such a degree that the natural soil is not readily observable. Slopes are 0 to 5 percent.

Most areas of the Canaveral soils have been modified by grading or shaping or have been otherwise altered for community development, and although the soils can be recognized and are the same as those described as typical for the Canaveral series, close investigation is difficult in most areas. In older communities, alteration has generally not been as extensive as in the newer, more densely developed communities. In the newer communities, the streets commonly are excavated below the level of the original land surface and serve as drainageways. The excavated material is spread over adjacent land areas.

Included with this complex in mapping are small areas of Arents and Palm Beach soils. Also included are small areas of soils bordering the Intracoastal Waterway that are similar to the Canaveral soils but are more poorly drained. In scattered spots within areas of these wetter soils, a thin to thick layer of muck is in or below the profile.

Present land use precludes the use of this map unit for crops, pasture, or trees. Most areas of the Canaveral soils in this unit are used for lawn grasses and ornamentals. For satisfactory plant growth, regular applications of water and fertilizer are needed.

This complex is not assigned to a capability subclass.

Dade Series

The Dade series consists of nearly level, well drained soils on slightly elevated pine and palmetto flatlands in the southeastern part of the county. These soils formed in sandy marine deposits of variable thickness over soft, porous limestone. These soils are droughty, and the water table is at a depth of 60 to 72 inches for 1 to 2 months and below a depth of 72 inches the rest of the year.

Typically, the surface layer is dark gray fine sand about 6 inches thick. The subsurface layer is white fine sand about 17 inches thick over light gray fine sand about 4 inches thick. At a depth of 27 inches, the subsoil is reddish brown fine sand about 5 inches thick over 3 inches of brown fine sand. Soft limestone is at a depth of about 35 inches.

Permeability is very rapid in all layers of these soils. Available water capacity, organic matter content, and natural fertility are very low.

These soils are unsuited to cultivated crops or citrus, and they are poorly suited to improved pasture. They are found only in areas that are being developed for urban uses.

Typical pedon of Dade fine sand in an area of grassy idle land about 1.5 miles east of U.S. Highway 441 and about 200 feet north of Pembroke Road, SE1/4SE1/4NE1/4 sec. 19, T. 51 S., R. 42 E.:

Ap—0 to 6 inches; dark gray (10YR 4/1) fine sand; weak fine granular structure; very friable; many fine and medium roots; mildly alkaline; clear wavy boundary.

A21—6 to 23 inches; white (10YR 8/1) fine sand; single grained; loose; few fine roots; mildly alkaline; gradual wavy boundary.

A22—23 to 27 inches; light gray (10YR 7/2) fine sand; single grained; loose; few fine roots; mildly alkaline; clear wavy boundary.

B2h—27 to 32 inches; reddish brown (5YR 4/3) fine sand; single grained; loose; few fine roots; few pockets or lenses of dark reddish brown (5YR 3/3); mildly alkaline; gradual irregular boundary.

B3—32 to 35 inches; brown (7.5YR 5/4) fine sand; single grained; loose; few fine roots; few pockets or lenses of very pale brown (10YR 8/4) and yellow (10YR 7/6); moderately alkaline; clear irregular boundary.

IICr—35 inches; soft limestone with numerous solution holes and cavities filled with pale brown fine sand and fragments of limestone and common pinnacles of limestone extending toward the surface.

On the average, solum thickness and depth to limestone range from 20 to 40 inches; however, the depth to limestone is highly variable. Commonly, rock is exposed on the surface or is within the plow layer, and solution holes are below 60 inches within each pedon. All horizon boundaries below the Ap horizon tend to follow the contour of the rock surface, and lower horizons are discontinuous because of columns of rock projecting toward the surface. Rock outcroppings are none to common. Soil reaction commonly is slightly acid to moderately alkaline in all horizons, but the range includes medium acid in the A horizon.

The Ap or A1 horizon is very dark gray, very dark grayish brown, dark grayish brown, dark gray, gray, grayish brown, or light brownish gray. The A2 horizon is light brownish gray, light gray, white, pale brown, very pale brown, or yellow. Texture of the A2 horizon is fine sand or sand. Total thickness of the A horizon ranges from 16 to 36 inches.

The B2h horizon is dark reddish brown, reddish brown, dark brown, brown, pale brown, grayish brown, dark grayish brown, or very dark grayish brown. Texture is fine sand or sand. Thickness ranges from 0 to 12 inches, and the horizon is discontinuous in most pedons.

The B3 horizon, where present, is pale brown, light yellowish brown, brown, yellowish brown, dark yellowish brown, or dark brown. Texture is fine sand or sand. Thickness ranges from 0 to 8 inches.

Some pedons have a Bir horizon in place of a Bh horizon. Where present it is very pale brown, yellow, light yellowish brown, yellowish brown, brownish yellow, brown, or strong brown. Texture is sand or fine sand. Thickness ranges from 0 to 36 inches, but is commonly less than 10 inches. The horizon is discontinuous in most pedons.

The underlying limestone is soft, porous, and very thick. Depth to the limestone is highly irregular and may vary as much as 5 feet within short distances.

Dade soils are geographically closely associated with Basinger; Duette; Immokalee, limestone substratum; and Margate soils. Basinger soils are poorly drained and do not have limestone within 80 inches. Duette soils have a spodic horizon and do not have limestone. Immokalee, limestone substratum, soils are poorly drained and have a spodic horizon. Margate soils are similar to Dade soils but are poorly drained. Perrine and Plantation soils are also associated with Dade soils in a few places.

Dd—Dade fine sand. This is a nearly level, well drained sandy soil on slightly elevated flatlands in the southeastern part of the county. Soft limestone is at depths that average between 20 and 40 inches. Included with this soil in mapping are small areas of similar soils that do not have a subsoil horizon but in which white fine sand rests directly on limestone. Also included are small areas of similar soils that are moderately well drained; small areas of Basinger, Duette, and Margate soils; and small areas of Immokalee, limestone substratum soils. Loamy sand and sandy loam Bt horizons are in the bottom of some of the deeper solution holes.

Under natural conditions this soil is unsuited to crops or citrus. It is poorly suited to pasture. Irrigation and regular applications of fertilizers are needed to overcome droughtiness and infertility.

Most of the acreage of this soil lies within areas that are being developed for urban uses, to which this soil is well suited. What little natural vegetation remains consists of slash pine, scrub oak, live oak, laurel oak, sawpalmetto, coontie, gopher apple, and pineland threeawn.

This soil is in capability subclass VIs.

Du—Dade-Urban land complex. This complex consists of Dade fine sand, which makes up the open areas, and of Urban land, which is covered by concrete and buildings. The areas of these components are so intermixed or so small that separation at the scale of mapping is impractical. The water table is below a depth of 60 inches.

About 50 to 70 percent of the complex is open land, such as lawns, vacant lots and playgrounds, and about 30 to 50 percent is Urban land. The rest is made up of small areas of Basinger; Immokalee, limestone substratum; and Margate soils that have been modified by filling to overcome wetness.

The Dade soil in the open areas, is nearly level, well drained, and sandy and has limestone at varying depths. It is similar to the soil described as typical of the series. In most places, a thin layer of gravelly sand has been spread over the surface of these soils to stabilize the loose, dry sands of the natural surface. This mantle is commonly less than 8 inches thick, but it may range up to 18 inches thick.

The Urban land part is covered by streets, sidewalks, parking lots, buildings, and other structures which obscure or alter the soil to such a degree that identification is not feasible.

In the older communities, the soil has generally not been altered as much as it has in the newer, more densely populated communities. In the newer communites, the streets commonly are excavated below the level of the original land surface and serve as drainageways. The excavated material is spread over adjacent areas.

This map unit is used exclusively for urban purposes. The Dade soil in this map unit is used for lawns, parks, playgrounds, golf courses, cemeteries, or open space. Irrigation and regular applications of fertilizers are needed before lawns and ornamental shrubs can be grown successfully.

This complex is not assigned to a capability subclass.

Dania Series

The Dania series consists of nearly level, very poorly drained soils in broad flats along the eastern part of the Everglades. These soils formed in thin beds of hydrophytic nonwoody plant remains. Under natural conditions they are covered by water most of the year. Where drainage has been improved, water stands on the surface for 2 to 6 months each year. When water is not standing on the surface, the water table is at a depth of less than 10 inches.

Typically, the upper 14 inches is sapric material, or muck. It is black in the upper 6 inches and dark reddish brown in the lower 8 inches. Below this is brown fine sand to a depth of 16 inches and light gray sandy marl that is about 50 percent limestone fragments to a depth of 18 inches. Limestone is at a depth of 18 inches.

Permeability is rapid in all layers of these soils. Available water capacity is very high in the organic layers and low in the mineral layers. Content of organic matter is very high, and natural fertility is moderate.

Dania soils are suited to improved pasture grasses but because of excessive wetness are not suited to cultivated crops or citrus.

Typical pedon of Dania muck, about 10 miles west of University Drive in Davie, about 1.5 miles east of the intersection of Orange Drive and U.S. Highway 27 on Orange Drive, and 0.3 mile north, NE1/4NE1/4SE1/4 sec. 26, T. 50 S., R. 39 E.:

Oa1—0 to 6 inches; black (N 2/0), rubbed and unrubbed, sapric material; 7 percent fiber, 2 percent rubbed; 65 percent organic material; moderate medium granular structure; friable; many medium and fine roots; pale brown (10YR 6/3) sodium pyrophosphate extract; slightly acid (pH 6.1 in 0.01*M* calcium chloride); gradual smooth boundary.

Oa2—6 to 14 inches; dark reddish brown (5YR 2/2), rubbed and unrubbed, sapric material; about 8 percent fiber; about 64 percent organic material; moderate medium granular structure; friable; few coarse and fine roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; slightly acid (pH 6.1 in 0.01*M* calcium chloride); clear wavy boundary.

IIC—14 to 16 inches; brown (10YR 5/3) fine sand; single grained; loose; slightly acid; abrupt irregular boundary.

IIIC—16 to 18 inches; light gray (10YR 7/1) sandy marl; single grained; loose; about 50 percent limestone fragments; moderately alkaline; abrupt irregular boundary.

R—18 inches; hard fractured limestone that can be excavated using power equipment.

The profile ranges from 14 to 20 inches in thickness, and the Oa horizon, or the organic material, is 12 to 20 inches in thickness. The organic material is more than twice as thick as the mineral material. Fiber content ranges from 5 to 16 percent. Reaction is strongly acid to slightly acid in 0.01*M* calcium chloride.

The Oa1 horizon is black, dark reddish brown, or very dark brown rubbed. Unrubbed colors are black and dark reddish brown. Sodium pyrophosphate extract is pale brown, light yellowish brown, yellowish brown, or brown. This horizon is 4 to 10 inches in total thickness. The Oa2 horizon is black or dark reddish brown rubbed and unrubbed. Sodium pyrophosphate extract for this horizon is light yellowish brown, yellowish brown, brown, or dark brown. The thickness of the Oa2 horizon is 8 to 10 inches.

The IIC horizon is brown, pale brown, dark gray, dark grayish brown, or very dark gray. This horizon has mottles of any of these colors in some areas. It is fine sand or sand that is mixed with some organic matter and is 1 to 4 inches thick. Reaction is slightly acid to mildly alkaline. The IIIC horizon is white or light gray. It is mixed with about 40 to 60 percent limestone fragments and is 1 to 5 inches thick. Reaction is mildly alkaline to moderately alkaline.

Dania soils are associated with Hallandale, Lauderhill, and Plantation soils. They are organic soils, whereas Hallandale soils are mineral soils. Also they have limestone at a depth of less than 20 inches, whereas Lauderhill and Plantation soils have limestone at a depth of more than 20 inches.

Da—Dania muck. This is a nearly level, very poorly drained, organic soil underlain by limestone at a depth of 14 to 20 inches. It is in broad flats along the eastern edge of the Everglades.

Included with this soil in mapping are small areas of Lauderhill muck and Plantation muck. Also included are some soils that have solution holes in the limestone that extend to a depth of more than 50 inches.

Most of the acreage of this soil is in natural vegetation that consists of sawgrass, lilies, and sedges. In some areas where the sawgrass has been burned, melaleuca has become established. A few areas are used for improved pasture.

This soil is unsuited to cultivated crops or citrus because of the thin layer of organic material above the limestone and because of wetness and ponding. Good pasture of improved grasses or grass and clover can be produced with intensive management. Some water control is needed to keep water from standing on the surface most of the year. Nitrogen fertilizer is not needed, but the soil responds to fertilizer containing potassium and phosphorus. Grazing should be carefully controlled.

This soil is in capability subclass IVw.

Duette Series

The Duette series consists of nearly level, moderately well drained soils on low ridges and knolls in the eastern part of the survey area. These soils formed in deep deposits of marine sands. In most years, the water table is at a depth of 48 to 72 inches for 2 to 4 months and below this for most of the rest of the year.

Typically, the surface layer is very dark gray sand about 3 inches thick. The subsurface layer is white sand 47 inches thick. The subsoil extends to a depth of more than 80 inches. In the upper 16 inches it is light brownish gray sand, and in the lower part it is black sand in which the sand grains are well coated with organic matter.

Permeability is very rapid to a depth of 66 inches and moderately rapid below this depth. Available water capacity is very low in the upper 66 inches and medium between depths of 66 and 80 inches. Natural fertility and organic matter content are low.

These soils are unsuited to cultivated crops or citrus. They are poorly suited to improved pasture.

Typical pedon of Duette sand in an area of partly cleared land 0.5 mile west of I-95, one block south of Broward Boulevard and 150 feet west of SW 27th Avenue, Ft. Lauderdale, NE1/4NE1/4NW1/4 sec. 8, T. 50 S., R. 42 E.:

A1—0 to 3 inches; very dark gray (10YR 3/1) sand; weak fine granular structure; very friable; many fine roots; mildly alkaline; clear wavy boundary.

A21—3 to 8 inches; light gray (10YR 6/1) sand; single grained; loose; common fine to coarse roots; many small pockets of gray (10YR 5/1) and white (10YR 8/1) sand; mildly alkaline; gradual wavy boundary.

A22—8 to 50 inches; white (10YR 8/1) sand; single grained; loose; few fine to coarse roots; few to common very dark gray (10YR 3/1) to gray (10YR 5/1) streaks in old root channels; neutral; gradual wavy boundary.

B1h—50 to 66 inches; light brownish gray (10YR 6/2) sand; single grained; loose; few medium roots; sand grains thinly coated with organic matter; few darker streaks in old root channels; neutral; abrupt wavy boundary.

B2h—66 to 80 inches; black (10YR 2/1) sand; massive; very friable; few medium roots; most sand grains well coated with organic matter; common clean sand grains; few large pockets weakly cemented; slightly acid.

Duette soils are 80 inches or more in thickness. Soil reaction ranges from very strongly acid to mildly alkaline in the A horizon and from extremely acid to neutral in the Bh horizon. Texture is sand or fine sand throughout.

The A1 horizon is very dark gray, dark gray, light brownish gray, gray, very dark grayish brown, dark grayish brown, or grayish brown. The A2 horizon is gray, grayish brown, light brownish gray, light gray, or white. Total thickness of the A horizon ranges from 50 to 80 inches.

The B1h horizon is dark grayish brown, dark gray, gray, or grayish brown. It is 0 to 16 inches thick.

The B2h horizon is black, very dark brown, very dark gray, dark brown, or dark reddish brown. Some pedons contain pockets or fragments that are weakly cemented.

Duette soils are geographically associated with Basinger; Dade; Immokalee, limestone substratum; Margate; Pomello; and Pompano soils. Basinger, Immokalee, and Pompano soils are poorly drained. Immokalee, limestone substratum, soils and Margate soils are poorly drained and overlie limestone. Dade soils are well drained and overlie limestone. Pomello soils have a Bh horizon between depths of 30 and 50 inches.

Df—Duette-Urban land complex. This complex consists of 50 to 70 percent Duette soils, commonly in open areas of lawns, vacant lots, and playgrounds; and 30 to 50 percent Urban land, in which the natural soil is mostly covered by pavement or buildings and cannot be readily observed. The Duette soils and Urban land are so intermixed or areas of each are so small that to map them separately at the scale of mapping used is impractical.

The Duette soils are nearly level, moderately well drained, deep, and sandy. The profile is the same as that described as typical of the series. Most areas of Duette soils have been modified or altered for community development, and the extent of the changes is generally greater in newer, more densely developed communities than in the older communities. In the newer communities, the streets commonly are excavated below the level of the original land surface and serve as drainageways. The excavated material is spread over adjacent areas. This overburden material is generally between 4 and 12 inches thick and consists primarily of sand or gravelly sand. Urbanized areas of Pomello soils, which have a black, sandy subsoil at a depth of 30 to 50 inches, were considered as part of this complex in mapping. They are so similar in behavior to the Duette soils that to map them separately would serve no purpose.

Included with this complex in mapping are small areas of Basinger, Dade, Immokalee, and St. Lucie soils. Also included are small areas of soils similar to Duette soils that rest on limestone.

Present land use prevents the use of this map unit for crops, pasture, or commercial trees. The Duette part of this map unit is used for lawns, parks, playgrounds, cemeteries, or open space. Irrigation and regular applications of fertilizer are needed before lawns and ornamental shrubs can be grown successfully.

This complex is not assigned to a capability subclass.

Hallandale Series

The Hallandale series consists of nearly level, poorly drained, sandy soils in broad flats east of the Everglades and west of the Atlantic Coastal Ridge. These soils formed in sandy marine sediment over limestone. Under natural conditions ponding may occur after heavy rains. In most years the water table is at a depth of 10 inches or less for 4 to 6 months and between depths of 10 and 20 inches for 6 months or more. During very dry periods water remains briefly in solution holes in the limestone. Near large drainage canals the water table fluctuates with the water level in the canals, and much of the time it is below a depth of 20 inches.

Typically, the surface layer is black fine sand about 4 inches thick. The subsurface layer is light brownish gray fine sand about 6 inches thick. The subsoil is brown fine sand about 4 inches thick over 2 inches of yellowish brown fine sand that contains decomposed limestone fragments. Limestone is at a depth of 16 inches.

Permeability is moderate to moderately rapid throughout. Available water capacity is low in the surface layer and the layer above the limestone and very low between depths of 4 and 14 inches. Content of organic matter and natural fertility are low.

Hallandale soils are suited to improved pasture, but because of excessive wetness and shallowness to limestone, they are not suited to cultivated crops or citrus.

Typical pedon of Hallandale fine sand about 0.5 mile north of Stirling Road and 0.2 mile east of Hunter Lane and Holatee Trail Junction, NE1/4NW1/4SW1/4 sec. 34, T. 50 S., R. 40 E.:

A1—0 to 4 inches; black (10YR 2/1) fine sand; weak fine granular structure; very friable; many medium and fine roots; strongly acid; clear smooth boundary.

A2—4 to 10 inches; light brownish gray (10YR 6/2) fine sand; few fine faint very dark gray mottles and streaks along root channels; single grained; loose; few fine roots; cyclic thickness of 2 to 8 inches; medium acid; gradual wavy boundary.

B1—10 to 14 inches; brown (10YR 5/3) fine sand; few faint very dark grayish brown mottles; single grained; loose; many uncoated, few well coated, and some thinly coated or partly coated sand grains; cyclic thickness of 1 to 20 inches; medium acid; gradual wavy boundary.

B2—14 to 16 inches; yellowish brown (10YR 5/4) fine sand and very pale brown (10YR 8/4) decomposed limestone fragments; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; single grained; loose; slight increase in clay content; common clean sand grains; discontinuous; cyclic thickness of 0 to 8 inches; neutral; abrupt irregular boundary.

IIR—16 inches; hard, fractured limestone that can be excavated using power equipment.

Thickness of the solum and depth to limestone are commonly 7 to 20 inches, but solution holes as deep as 50 inches or more are within the profile.

The A1 horizon is black, very dark gray, dark gray, or gray. The A2 horizon is light brownish gray, gray, or grayish brown. The A horizon ranges from 4 to 14 inches in thickness and from strongly acid to slightly acid in reaction.

The B1 horizon is brown, pale brown, dark brown, or grayish brown. Reaction ranges from medium acid to mildly alkaline. In some profiles the B1 horizon is absent, but, where present, it ranges from 1 to 20 inches in thickness. The B2 horizon is yellowish brown, dark yellowish brown, or brown fine sand 0 to 8 inches thick. This horizon has an average of about 1 to 3 percent more clay than the B1 horizon. Sandy clay loam or sandy loam is discontinuous where the B2 horizon contacts the limestone. Grayish marly material containing small fragments of weathered rock or carbonatic material is also present at the surface of the limestone. Reaction in the B2 horizon is neutral to moderately alkaline.

The IIR horizon is hard, fractured limestone that has many solution holes. These holes range from about 4 inches to 3 feet in diameter and are at intervals of 1 to 6 feet. They are filled with gray (10YR 5/1), light brownish gray (10YR 6/2), pale brown (10YR 6/3), or very pale brown (10YR 7/4) fine sand. Solution holes are 50 inches or more in depth.

Hallandale soils are associated with Boca, Dania, Margate, and Plantation soils. They differ from Boca, Margate, and Plantation soils by having limestone at a depth of 20 inches or less. Also, they do not have the loamy B horizon of Boca soils. Hallandale soils do not have the layers of muck or organic matter of Dania and Plantation soils.

Ha—Hallandale fine sand. This nearly level, poorly drained, sandy soil is underlain by limestone at a depth of 7 to 20 inches. It is in broad flats east of the Everglades and west of the Atlantic Coastal Ridge. This soil has the profile described as typical of the series.

Included with this soil in mapping are small areas of Margate fine sand, Dania muck, and Plantation muck. In some areas a thin layer, 4 inches thick or less, of organic material is on the surface.

Most of the acreage of this soil is in natural vegetation or improved pasture. The natural vegetation consists of scattered slash pine and sawpalmetto, pineland threeawn, paspalum, bluejoint panicum, blue maidencane, and bluestem.

This soil is poorly suited to cultivated crops or citrus. Good pasture of improved grasses or grass and clover can be produced under intensive management. Some water control and fertilization with trace elements are needed.

This soil is in capability subclass IVw.

Hb—Hallandale-Urban land complex. This complex consists mainly of Hallandale fine sand and Urban land. The areas of these components are so intermixed or so small that separation at the scale of mapping is impractical. Depth to the water table depends on the established drainage in the area.

About 20 to 45 percent of the complex is open land, such as lawns and vacant lots, and about 40 to 70 percent is Urban land. The rest is modified areas of Margate, Pompano, and Basinger soils and filled ponds.

The open land consists of nearly level, poorly drained Hallandale soil that has been modified in most places by spreading fill material on the surface of the original soil to an average thickness of about 12 inches. The original soil below the fill material is Hallandale fine sand. About 80 percent of the fill material consists of a mixture of sand, limestone, and shell fragments that range from sand size to about 3 inches in diameter. The remaining 20 percent is sand.

The Urban land consists of areas covered by sidewalks, streets, patios, driveways, buildings, and other construction related to urban use.

The Margate soils have also been modified by spreading fill material on the surface of the original soil to an average thickness of about 12 inches, and the Pompano and Basinger soils have been modified by spreading fill material on the surface of the original soil.

The determined use of the soils for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Hm—Hallandale and Margate soils. These are nearly level, poorly drained soils that have been modified by grading, shaping, and covering with 8 to 20 inches of fill material. These alterations were made to provide a base for construction of homes, streets, and industrial buildings. Depth to the water table in these soils is variable and depends on the established drainage in the area.

Hallandale soil covered by fill material makes up about 45 percent of the total acreage, and Margate soil covered with fill makes up about 35 percent. The remaining 20 percent is mostly filled ponds, areas of Pompano soils, and areas of Basinger soils that have been modified by spreading fill on the surface of the original soil.

Included with these soils in mapping are small areas of Urban land.

The fill material on these soils consists of sand, shell fragments, and limestone fragments. About 80 percent of the fill is mixed shell and limestone fragments ranging from sand size to 3 inches in diameter. The average thickness of the fill on these soils is about 12 inches, but some areas that originally were the lower areas in the landscape are covered by as much as 5 feet of fill material.

Planned use of these soils is for urban development only.

These soils are not assigned to a capability subclass.

Immokalee Series

The Immokalee series consists of nearly level, poorly drained soils on broad, low ridges in the eastern part of the survey area. These soils formed in unconsolidated marine sediment. Under natural conditions they have a water table at a depth of 10 inches or less for 1 to 4 months in most years, and at a depth of 10 to 40 inches for most of the rest of the year. In some years these soils are covered with shallow water for a few days.

Typically, the surface layer is dark gray fine sand about 6 inches thick. The subsurface layer is 34 inches of fine sand. The upper 14 inches is light gray, and the lower 20 inches is white. The subsoil extends to a depth of 80 inches. The upper 22 inches is black fine sand that is coated with organic matter. The next 3 inches is dark reddish brown fine sand that has black mottles and is coated with organic matter. The lower 15 inches is dark brown fine sand.

Permeability is moderate to moderately rapid in the subsoil and rapid in all other layers. Available water capacity is medium to high in the subsoil and very low in all other layers. Content of organic matter and natural fertility are low.

Where adequate water control and good management practices are in use, Immokalee soils are suited to winter truck crops and improved pasture grasses.

Typical pedon of Immokalee fine sand, 350 feet west of railroad and 1.25 miles south of Hillsborough Boulevard, SE1/4NW1/4 sec. 11, T. 48 S., R. 42 E.:

A1—0 to 6 inches; dark gray (10YR 4/1), rubbed, fine sand; light gray (10YR 7/1), unrubbed and dry, sand grains mixed with some organic matter; single grained; loose; common fine and medium roots; strongly acid; clear smooth boundary.

A21—6 to 20 inches; light gray (10YR 7/1) fine sand; single grained; loose; few fine and medium roots; strongly acid; clear smooth boundary.

A22—20 to 40 inches; white (10YR 8/1) fine sand; few fine distinct very dark gray (10YR 3/1) streaks along root channels; single grained; loose; strongly acid; clear wavy boundary.

B21h—40 to 62 inches; black (10YR 2/1) fine sand; few medium faint dark reddish brown (5YR 2/2) mottles; weak medium granular structure; firm; most sand grains coated with organic matter; very strongly acid; gradual smooth boundary.

B22h—62 to 65 inches; dark reddish brown (5YR 2/2) fine sand; many medium faint black (5YR 2/1) mottles that are weakly cemented; weak medium granular structure; friable; most sand grains coated with organic matter; very strongly acid; gradual smooth boundary.

B3—65 to 80 inches; dark brown (7.5YR 4/4) fine sand; common fine faint dark reddish brown (5YR 2/2) weakly cemented Bh bodies; weak medium granular structure; friable; strongly acid.

Thickness of the solum is 40 inches of more. Depth to the Bh horizon ranges from 30 to 50 inches. Reaction ranges from very strongly acid to strongly acid throughout.

The A1 or Ap horizon is very dark gray, very dark grayish brown, or dark gray and is 4 to 8 inches thick. The A21 horizon is gray, light brownish gray, light gray, or white and is 4 to 28 inches thick. The A22 horizon is white, gray, or light brownish gray with very dark gray or very dark grayish brown streaks and is 15 to 30 inches thick. An A23 horizon that is light brownish gray, light gray, or white and has very dark grayish brown or dark gray streaks is present in places. It is 0 to 15 inches thick. The entire A horizon is 30 to 50 inches thick.

The B21h horizon is black, very dark brown, or dark reddish brown and in places has a few mottles of light brownish gray to light gray. It is 4 to 24 inches thick. The B21h horizon is well coated with organic matter. The B22h horizon is dark reddish brown or dark brown and in places has a few black mottles that are weakly cemented. Most sand grains are well coated to thinly coated with organic matter. The B22h horizon is 3 to 15 inches thick. The B3 horizon is dark brown or dark yellowish brown and has a few to common dark reddish brown, weakly cemented Bh bodies. The B3 horizon is 0 to 16 inches thick.

In a few places a dark grayish brown C horizon is present.

Some pedons have soft, porous limestone containing solution holes filled with sand and rock fragments. Depth to the limestone ranges from 40 to 72 inches.

Immokalee soils are associated with Basinger, Pomello, and Pompano soils. They have a well coated Bh horizon, whereas Basinger soils have a C&Bh horizon that is thinly coated with organic matter. They are similar to Pomello soils but are poorly drained, whereas Pomello soils are moderately well drained. They have a Bh horizon that Pompano soils do not have.

Ia—Immokalee fine sand. This is a nearly level, deep, poorly drained, sandy soil that has a layer well coated with organic matter at a depth of 30 inches or more. It is on broad, low ridges in the eastern part of the survey area. This soil has the profile described as typical of the series.

Included with this soil in mapping are small areas of Basinger fine sand, Pompano fine sand, and Margate fine sand. Also included are a few areas of soils that have a thin subsoil that has an accumulation of some organic matter and some areas where the surface layer is gray.

A large part of the acreage of this soil is in natural vegetation that consists of slash pine, sawpalmetto, and native grasses (fig. 6).

This soil is limited for cultivated crops and improved pasture by wetness, very low available water capacity in the upper 40 inches, low content of organic matter, and low natural fertility. Where adequate water control and intensive management are in use, this soil is suited to most truck crops (fig. 7) and to improved pasture grasses and clover. A water-control system that provides subsurface irrigation by controlling the water table is needed. This soil is poorly suited to citrus. Where adequate water control and intensive management and fertilization are in use, however, some citrus can be grown. The soil responds well to application of complete fertilizer and lime. This soil is in capability subclass IVw.

Ir—Immokalee, limestone substratum-Urban land complex. This complex consists of Immokalee, limestone substratum, and Urban land. The areas of these components are so intermixed or so small that mapping them separately was not practical. Depth to the water table depends on the established drainage in the area and the amount of fill material that has been added, but the water table is deeper in most areas than is normal for undrained Immokalee soils.

About 30 to 50 percent of the complex is open land, such as lawns, vacant lots, and playgrounds; and about 40 to 70 percent is Urban land, or areas covered by sidewalks, streets, parking lots, and buildings, where the natural soil cannot be observed.

The open land consists of nearly level, poorly drained Immokalee, limestone substratum, soils. Typically, the surface layer is very dark gray sand about 5 inches thick. The subsurface layer is light gray and white sand to a depth of about 48 inches. The subsoil is black sand about 10 inches thick. The sand grains are well coated with organic matter in this layer. Soft, porous limestone containing solution holes filled with sand and rock fragments is at a depth of about 58 inches. Most areas of these soils are covered by 4 to 20 inches of gravelly sand fill material.

In the older communities, the soil has generally not been altered as much as it has in newer, more densely developed communities. In the newer communities, the

Figure 6.—Typical vegetation of slash pine, sawpalmetto, and native grasses in an area of Immokalee fine sand.

streets commonly are excavated below the level of original land surface and serve as drainageways. The excavated material is spread over adjacent areas.

Included with this complex in mapping are small areas of Basinger, Immokalee, Margate, and Pompano soils. These soils have been altered by having had fill material up to 20 inches thick spread over the surface of the original soil. Also included are Arents and Udorthents.

Present land use precludes the use of this map unit for crops, pasture, or commercial trees. Most of the Immokalee, limestone substratum, part of this unit is used for grasses and ornamentals. Adequate surface drainage, proper watering, and regular applications of fertilizer are needed for satisfactory plant growth.

This complex is not assigned to a capability subclass.

Iu—Immokalee-Urban land complex. This complex consists of Immokalee fine sand and Urban land. The areas of these components are so intermixed or so small that separation at the scale of mapping is impractical. Depth to the water table depends on the established drainage in the area.

About 20 to 45 percent of the complex is open land, such as lawns and vacant lots; and about 40 to 70 percent is Urban land, or areas covered by sidewalks, streets, patios, driveways, and buildings, where the natural soil cannot be observed.

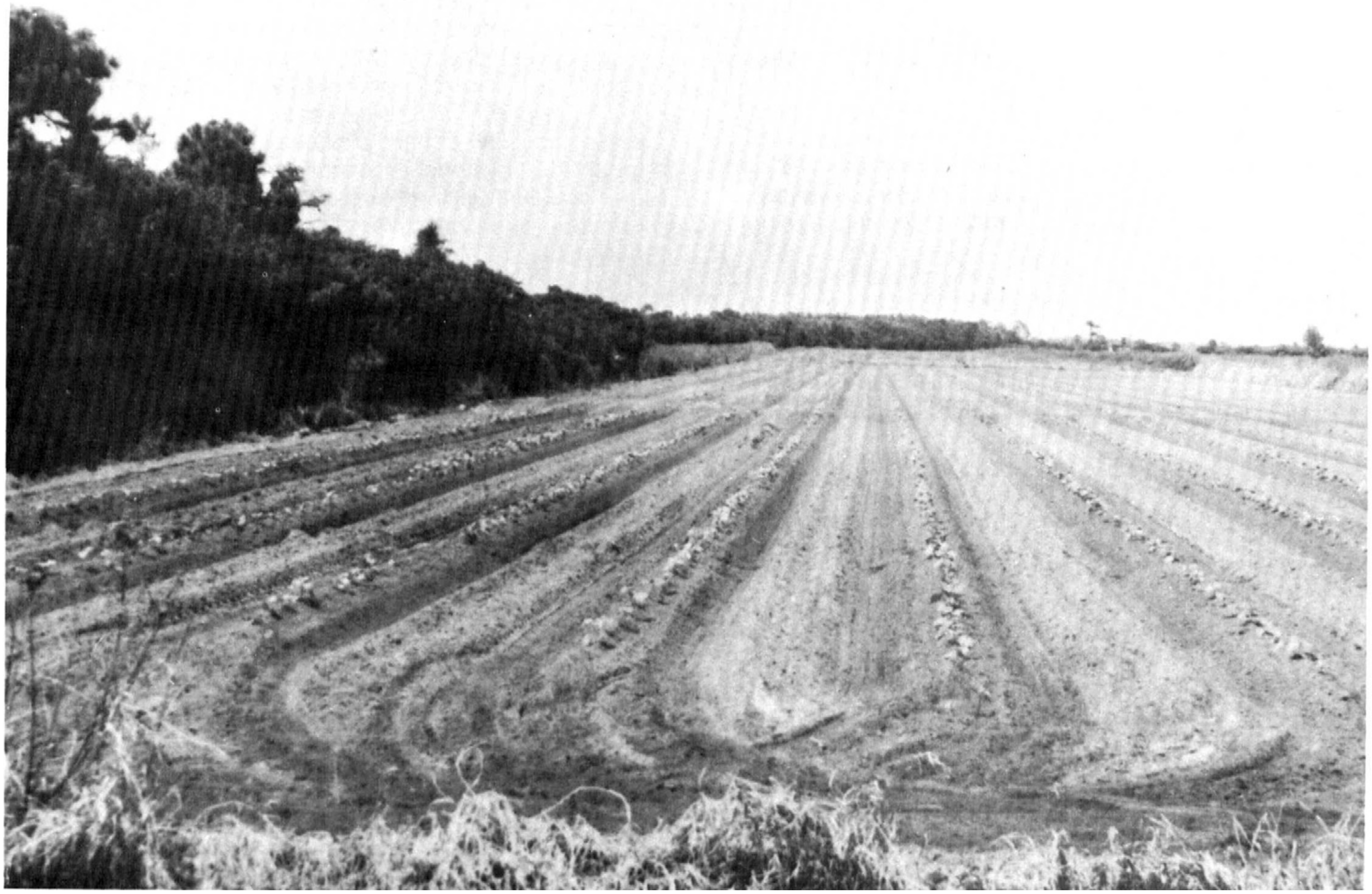

Figure 7.—Eggplant in an area of Immokalee fine sand where water control measures and intensive management are in use.

The open land consists of nearly level, poorly drained Immokalee soils that have been modified in most places by spreading sandy material on the surface of the soil to an average thickness of about 12 inches, but ranging from about 6 to 20 inches. About 10 percent of the Immokalee soils have not been modified. The original soil below the fill material is Immokalee fine sand.

Included with this complex in mapping are small areas of Basinger, Pompano, Margate, and Hallandale soils. These soils have been modified by spreading fill material on the surface of the original soil.

About 80 percent of the fill material on the Immokalee soils is sand. The rest of the fill material on the Immokalee soils and most of the fill material on the other soils consist of a mixture of shell fragments and limestone fragments ranging from sand size to about 3 inches in diameter.

The determined use of these soils for the foreseeable future is urban related.

The complex is not assigned to a capability subclass.

Lauderhill Series

The Lauderhill series consists of nearly level, very poorly drained soils in broad flats in the Everglades. These soils formed in hydrophytic plant remains mixed with a small amount of mineral material. Under natural conditions these soils are covered with water most of the year. Even where drainage has been improved, water stands on the surface for 6 to 12 months each year.

Typically, the upper 9 inches is black sapric material, or muck. Below this, to a depth of about 27 inches, is dark reddish brown sapric material. Between depths of 27 and 31 inches is dark reddish brown sapric material that is about 77 percent mineral material, of which 15 percent is clay. Hard limestone is at a depth of 31 inches.

Permeability is rapid in these soils. Available water capacity is very high throughout. Content of organic matter is very high, and natural fertility is high. These soils are subject to oxidation, which decreases the amount of their organic material each year.

Where adequate water control is in use, Lauderhill soils are well suited to winter truck crops and improved pasture.

Typical pedon of Lauderhill muck, approximately 700 feet west of U.S. Highway 27 and 1.75 miles south of Andytown, SE1/4SE1/4 sec. 4, T. 50 S., R. 39 E.:

Oa1—0 to 9 inches; black (10YR 2/1), rubbed and unrubbed, sapric material; 4 percent fiber; 67 percent organic material; moderate medium subangular blocky structure; friable; few fine and medium roots; brown (10YR 5/3) sodium pyrophosphate extract; neutral (pH 6/6) in 0.01*M* calcium chloride); clear wavy boundary.

Oa2—9 to 27 inches; dark reddish brown (5YR 2/2), rubbed and unrubbed, sapric material; 6 percent fiber; weak medium subangular blocky structure; friable; 60 percent organic material; few fine roots; brown (10YR 5/3) sodium pyrophosphate extract; slightly acid (pH 6.5 in 0.01*M* calcium chloride); gradual wavy boundary.

Oa3—27 to 31 inches; dark reddish brown (5YR 2/2), rubbed and unrubbed, sapric material; 20 percent fiber, 5 percent rubbed; 23 percent organic material; about 77 percent mineral material of which 15 percent is clay; moderate medium granular structure; friable; few large roots; brown (10YR 5/3) sodium pyrophosphate extract; neutral (pH 6.6 in 0.01*M* calcium chloride); abrupt irregular boundary.

IIR—31 inches, hard fractured limestone that can be excavated using power equipment.

Thickness of the organic material ranges from 20 to 40 inches. Hard limestone rock is below the soil at a depth of 20 to 40 inches. Where the organic material is less than 20 inches thick, a mineral layer up to 6 inches thick is between the organic material and limestone. Reaction ranges from medium acid to neutral in 0.01*M* calcium chloride.

The Oa1 horizon is black or dark reddish brown unrubbed. Rubbed colors are black, very dark brown, dark brown, or dark reddish brown. Sodium pyrophosphate extract for this horizon is pale brown, brown, light yellowish brown, or dark brown. Thickness of this horizon is 6 to 12 inches. The Oa2 horizon is black or dark reddish brown unrubbed. Rubbed colors are black, very dark brown, dark brown, or dark reddish brown. Sodium pyrophosphate extract for this horizon is light yellowish brown, very pale brown, very dark grayish brown, or brown. The thickness of this horizon is 10 to 20 inches. The Oa3 horizon is black, very dark gray, or dark reddish brown sapric material that is high in content of mineral material. It is 0 to 10 inches thick.

In many places, the Oa3 horizon is absent, and a IIC horizon is in the soil between the organic material and the limestone. Where present, this horizon is black, very dark gray, gray, or dark gray sand, loamy sand, or sandy loam with or without carbonatic material, or gray or white marl that is mixed with fragments of limestone in some areas. This horizon ranges to about 6 inches in thickness.

Lauderhill soils are associated with Dania, Hallandale, and Margate soils. They have limestone bedrock between depths of 20 and 40 inches, whereas Dania soils have limestone bedrock at a depth of less than 20 inches. They are organic soils, whereas Margate and Hallandale soils are mineral soils.

La—Lauderhill muck. This is a nearly level, very poorly drained, organic soil underlain by limestone at a depth of 20 to 40 inches. It is in broad flats in the Everglades.

Included with this soil in mapping are small areas of Dania muck and small areas of soils that have organic material 36 to 51 inches thick over limestone. Also included are small areas of Okeelanta muck.

Most of the acreage of this soil is in natural vegetation that consists of sawgrass. In some places where the sawgrass has been burned, melaleuca has become established. A few acres are in improved pasture.

This soil is severely limited for cultivated crops by excessive wetness. Where it is properly drained, it is well suited to winter truck crops. After drainage and the initial subsidence caused by compaction, subsidence by oxidation is a continual hazard. Thus, structures are needed that hold the water level at the proper depth for crops and permit flooding when the soil is left idle. In addition, fertilizer that is high in all plant nutrients except nitrogen should be applied frequently. Lime is needed in places.

This soil is unsuited to citrus; however, high quality pasture consisting of improved grasses or grass and clover can be produced under intensive management. A drainage system is needed for removing excess surface water and for maintaining the water table at shallow depths. Fertilizer and lime should be applied where needed. Grazing needs to be controlled.

This soil is in capability subclass IIIw in areas where drainage outlets are available and reclamation is feasible. Small areas without drainage outlets are in capability sublcass VIIw.

Margate Series

The Margate series consists of nearly level, poorly drained soils on low terraces between the Everglades and the Atlantic Coastal Ridge. These soils formed in sandy marine sediment over limestone. Under natural conditions they are covered by shallow water for 1 to 4 months. Where drainage has been improved, however, they are not. The water table is at a depth of 10 inches for 2 to 6 months in most years and at a depth of 10 to 30 inches most of the rest of the year. In very dry periods water remains briefly in solution holes in the limestone.

Typically, the surface layer is very dark gray fine sand about 8 inches thick. The subsurface layer is light brownish gray fine sand about 8 inches thick. The subsoil extends to a depth of 28 inches. The upper 10 inches of the subsoil is brown fine sand, and the lower 2 inches is brown fine sand mottled with black streaks in root channels. The lower part of the subsoil has about 2.5 percent more clay than the upper part. It is underlain by 4 inches of brown fine sandy loam and decomposed limestone fragments. Hard limestone rock is at a depth of 32 inches.

Permeability is rapid in all layers of these soils. Available water capacity is low in the surface layer and very low or low in all other layers. Natural fertility and content of organic matter are low.

Where adequate water control and good management practices are in use, these soils are suited to citrus, truck crops and improved pasture grasses.

Typical pedon of Margate fine sand, about 1,980 feet south of Griffin Road and 2,640 feet west of 106th Avenue, on Cherry Road, SW1/4NW1/4 sec. 31, T. 50 S., R. 41 E.:

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sand; single grained; loose; many fine and medium roots; very strongly acid; clear, smooth boundary.

A2—8 to 16 inches; light brownish gray (10YR 6/2) fine sand; few streaks of very dark gray (10YR 3/1) in root channels; single grained; loose; few fine roots; cyclic thickness of 2 to 8 inches; medium acid; gradual wavy boundary.

B1—16 to 26 inches; brown (10YR 5/3) fine sand, brown (10YR 4/3) in root channels; single grained; loose; few medium and fine roots; few clean sand grains, some partly coated; cyclic thickness of 2 to 10 inches; slightly acid; gradual wavy boundary.

B2—26 to 28 inches; brown (10YR 4/3) fine sand; common medium distinct black (10YR 2/1) mottles; single grained; loose; few medium and fine roots; about 2.5 percent increase in clay content from overlying horizon; many partly coated and common clean sand grains; cyclic thickness of 2 to 8 inches; neutral; abrupt irregular boundary.

C—28 to 32 inches; brown (10YR 5/3) gravelly fine sand; single grained; loose; about 50 percent very pale brown (10YR 7/4) fragments of limestone; moderately alkaline; abrupt irregular boundary.

IIR—32 inches; hard fractured limestone that can be excavated using power equipment.

Depth to limestone is variable within short distances because of the irregular surface of the limestone and numerous solution holes. The profile commonly ranges from 20 to 40 inches in thickness over limestone, but in many pedons it ranges up to 60 inches or more.

The A1 or Ap horizon is black, very dark gray, or dark gray and is 6 to 10 inches thick. Reaction in this horizon is very strongly acid to medium acid. The A2 horizon is gray, light brownish gray, or grayish brown and is 8 to 30 inches thick. Reaction is strongly acid to slightly acid.

The B1 horizon is brown, grayish brown, or pale brown and is 2 to 10 inches thick. The B2 horizon is dark grayish brown, brown, or grayish brown and is 2 to 8 inches thick. Texture is fine sand with a 1- to 3-percent increase in clay content. Reaction in the B1 and B2 horizons is slightly acid to mildly alkaline.

The C horizon is brown or yellowish brown fine sand or loamy fine sand mixed with fragments of hard limestone, soft carbonatic material, or both. Reaction is mildly alkaline or moderately alkaline. This horizon is 0 to 5 inches thick.

The IIR horizon is hard limestone that ranges from 20 to 60 inches or more in depth of the solution holes. The holes range from about 6 inches to 3 feet in diameter and occur at intervals of about 2 to 6 feet. They are filled with gray, grayish brown, light brownish gray, brown, very pale brown, or pale brown fine sand.

Margate soils are associated with Dania, Hallandale, Immokalee, and Lauderhill soils. They are mineral soils, whereas Dania and Lauderhill soils are organic. Margate soils have limestone at a depth of 20 to 60 inches, whereas Hallandale soils have limestone at a depth of less than 20 inches. Margate soils do not have a Bh horizon, and Immokalee soils do.

Ma—Margate fine sand. This is a nearly level, poorly drained, sandy soil that is underlain by limestone at a depth of 20 to 40 inches but has solution holes as deep as 60 inches. It is on nearly level, low terraces between the Everglades and the low, sandy Atlantic Coastal Ridge.

Included with this soil in mapping are small areas of Basinger fine sand and Plantation muck, and small areas of soils that have up to 8 inches of organic material on the surface. Also included are some areas of soils that are similar to Margate fine sand but have a very dark gray or black surface layer less than 6 inches thick to a dark gray or gray surface layer 3 to 6 inches thick.

The natural vegetation consists of native grasses, waxmyrtle, and a few cypress trees. Most areas of this soil are in improved pasture and some citrus.

This soil is severely limited for cultivated crops by excessive wetness and other poor soil properties. Truck crops and improved pasture grasses can be grown where water control, fertilization with a complete fertilizer and lime, and proper management practices are in use. Under very intensive management and adequate water

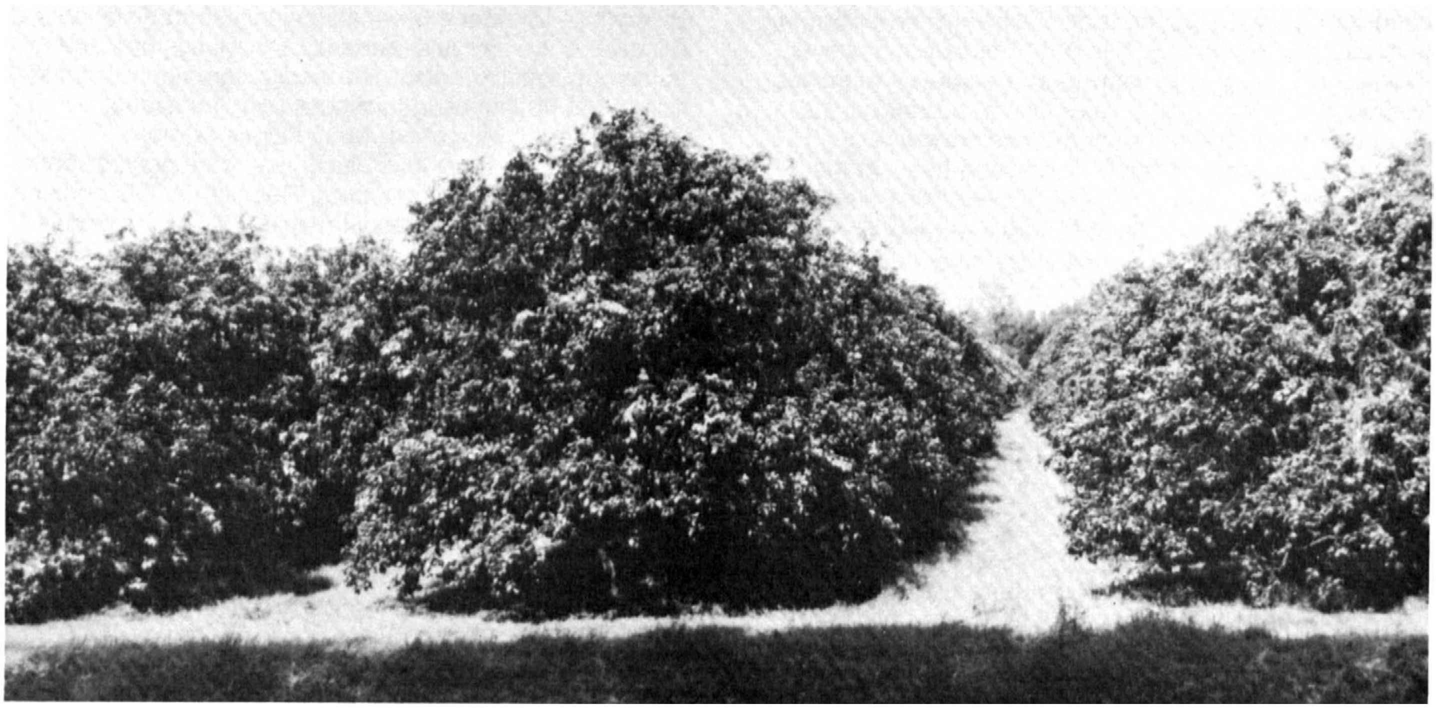

Figure 8.—Well managed citrus grove on Margate fine sand.

control, citrus can be grown on this soil (fig. 8). For all crops and pasture, a complete water-control system is needed that provides subsurface irrigation by controlling the water table.

This soil is in capability subclass IVw.

Mu—Margate-Urban land complex. This complex consists of Margate fine sand and Urban land. The areas of these components are so intermixed or so small that to separate them at the scale used in mapping is impractical. Depth to the water table depends on the established drainage in the area.

About 50 to 70 percent of the complex is open land, such as lawns, vacant lots, parks, and playgrounds; and about 30 to 50 percent is Urban land. The rest is made up of small areas of Basinger; Immokalee, limestone substratum; and Pompano soils that have been modified by spreading gravelly sand fill material over the surface of the original soil.

The open land consists of nearly level, poorly drained Margate soil that has been modified in most places by spreading fill material over the surface of the original soil to an average thickness of about 12 inches. The soil covered over by the fill material is Margate fine sand, which is similar to that described as typical of the Margate series. The fill material is a mixture of sand, limestone, and shell fragments that range from sand size to about 3 inches in diameter. About 65 to 95 percent of this material is sand.

Urban land consists of areas covered by streets, sidewalks, parking lots, buildings, and other constructions related to urban uses.

The determined use of these soils for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Okeelanta Series

The Okeelanta series consists of nearly level, very poorly drained organic soils in narrow to broad drainageways and swamps. These soils formed in thick deposits of hydrophytic plant remains over sandy marine sediments. Under natural conditions they are covered by shallow water most of the time. Even where drainage has been improved, these soils are periodically flooded for a few days. The water table is within a depth of 10 inches for 2 to 6 months in most years and within a depth of 20 inches most of the rest of the time.

Typically, the surface layer is black muck (sapric material) about 14 inches thick. Between depths of 14 and 40 inches is dark reddish brown muck. Below this is sand to a depth of 60 inches or more. This sand is black in the upper 4 inches and gray in the lower 16 inches.

Permeability is rapid in these soils. The available water capacity is very high in the organic materials and low in the underlying sands. Natural fertility is moderate. When these soils are not covered by water they oxidize, which results in subsidence or a decrease in the amount of organic material each year.

Where water is adequately controlled, Okeelanta soils are well suited to winter truck crops and improved pasture.

Typical pedon of Okeelanta muck in an area of fresh water swamp on the west side of U.S. Highway 441, about 0.5 mile south of Griffin Road, SE1/4SE1/4NW1/4 sec. 36, T. 50 S., R. 41 E.:

Oa1—0 to 14 inches; black (5YR 2/1) sapric material; less than 5 percent fiber unrubbed and rubbed; massive; sodium pyrophosphate extract dark yellowish brown (10YR 4/4); mildly alkaline (pH 7.6 in 0.01*M* calcium chloride); clear smooth boundary.

Oa2—14 to 22 inches; dark reddish brown (5YR 2/2) sapric material; about 30 percent fiber, less than 5 percent rubbed; massive; sodium pyrophosphate extract very pale brown (10YR 7/3); many pockets or lenses of black; mildly alakaline (pH 7.5 in 0.01*M* calcium chloride); gradual wavy boundary.

Oa3—22 to 40 inches; dark reddish brown (5YR 3/3) sapric material; about 45 percent fiber, 10 to 15 percent rubbed; massive; sodium pyrophosphate extract very pale brown (10YR 7/3); mildly alkaline (pH 7.8 in 0.01*M* calcium chloride); clear smooth boundary.

IIC1—40 to 44 inches; black (10YR 2/1) mucky sand; massive; few streaks of grayish brown (10YR 5/2) sand; estimated 15 percent organic matter content; neutral; clear wavy boundary.

IIC2—44 to 60 inches; gray (10YR 6/1) sand; single grained; loose; few coarse faint light brownish gray (10YR 6/2) small streaks or mottles; few darker streaks; neutral.

Thickness of the control section is 51 inches. Soil reaction ranges from medium acid to moderately alkaline by Hellige-Truog test. Thickness of organic material ranges from 16 to 40 inches.

The Oa1 horizon is black, very dark brown, or dark reddish brown. Fiber content ranges from 5 to 20 percent unrubbed, but is less than 5 percent rubbed. Sodium pyrophosphate extract ranges from very dark grayish brown to brown or yellowish brown. Mineral content is very low. Thickness ranges from 6 to 20 inches.

The Oa2 and Oa3 horizons are very dark brown or dark reddish brown. Fiber content ranges from 20 to 60 percent unrubbed, but is less than 15 percent rubbed. Sodium pyrophosphate extract ranges from yellowish brown to very pale brown or white. Mineral content ranges from about 10 to 40 percent.

The IIC1 horizon is black, very dark gray, or dark gray. Organic matter content ranges from about 2 to 20 percent. Texture is sand or fine sand. Thickness of this horizon ranges from 0 to 15 inches.

The IIC2 horizon is dark gray, dark grayish brown, gray, grayish brown, light grayish brown, or light gray. Texture is sand, fine sand, or loamy sand that may or may not contain shell fragments.

Okeelanta soils are associated with Basinger, Lauderhill, Margate, Plantation, and Sanibel soils. All of these except Lauderhill are mineral soils, although Plantation and Sanibel soils have a thin organic surface layer. Lauderhill soils are organic soils that overlie limestone rather than sand.

Ok—Okeelanta muck. This is a nearly level, very poorly drained organic soil underlain by sand at a depth of 16 to 40 inches. The soil is found in small to large, freshwater marshes, swamps, and drainageways in the broad flatlands east of the Everglades.

Included with this soil in mapping are small areas of soil that contain less decomposed organic material below the surface layer; soils that contain organic material 40 to 51 inches thick; and soils that are underlain by limestone at a depth of more than 51 inches. Also included are small areas of Basinger, Lauderhill, Margate, Plantation, and Sanibel soils.

A few areas of this soil have been cleared and are used for truck crops and pasture, but most areas remain in natural vegetation consisting of cypress, sawgrass, ferns, sedges, and other water-tolerant plants. A few areas are dominated by willow, Brazilian pepper, and melaleuca trees.

Under natural conditions this soil is not suited to cultivated crops, pasture, or woodland. If water is adequately controlled, the soil is well suited to truck crops, sugarcane, and pasture. A well designed and maintained water-control system should remove excess water during periods that crops are grown and should keep the soil saturated at all other times to prevent excessive oxidation of the organic soil material. Fertilizers containing phosphates, potash, and minor elements are needed. For pastures, Pangolagrass, bahiagrass, and white clovers produce well.

This soil is unsuited to urban uses. Excessive wetness and low bearing capacity are the major limiting factors. Water control, removal of the organic material, and filling with stable soil material are needed to make this soil suitable for such uses.

This soil is in capability subclass IIIw.

Palm Beach Series

The Palm Beach series consists of nearly level to sloping, excessively drained soils on long, narrow ridges adjacent to the coast. These soils formed in thick deposits of marine sand and shell fragments. The water table is below a depth of 80 inches.

Typically, the surface layer is sand and fragments of shell. The upper 3 inches is black, and the lower 4 inches is very dark grayish brown. Below this, mixed sand and fragments of shell extend to a depth of 80 inches or more. The sand grains are colorless quartz grains, but multicolored fragments of shell give this layer a color of light yellowish brown or very pale brown. Permeability is very rapid in all layers. The available water capacity is very low. Natural fertility and organic matter content are also very low.

These soils are unsuited to cultivated crops, citrus, or improved pasture. They are in areas being developed for urban uses and are well suited to most urban uses.

Typical pedon of Palm Beach sand, in a vacant lot near the crest of the beach ridge, about one block west of the beach on the south side of Oakland Park Boulevard, NE1/4NW1/4 sec. 30, T. 49 S., R. 43 E.:

A11—0 to 3 inches; black (10YR 2/1) sand, mixture of black organic matter and light colored sand; weak fine granular structure; very friable; common fine and medium roots; about 15 percent sand size fragments of shell; moderately alkaline; calcareous; clear smooth boundary.

A12—3 to 7 inches; very dark grayish brown (10YR 3/2) sand, mixture of organic matter and sand; single grained; loose; about 20 percent sand size fragments of shell; moderately alkaline; calcareous; clear wavy boundary.

C1—7 to 58 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; sand grains are clean; about 45 percent sand size fragments of shell; moderately alkaline; calcareous; gradual wavy boundary.

C2—58 to 68 inches; very pale brown (10YR 7/4) sand; single grained; loose; about 45 percent sand size fragments of shell; moderately alkaline; calcareous; gradual wavy boundary.

C3—68 to 80 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; about 45 percent sand size fragments of shell; moderately alkaline; calcareous.

Texture of the soil is sand throughout. All horizons effervesce weakly to strongly with dilute HCl. There are no subsurface diagnostic horizons within a depth of 80 inches. Some pedons have thin layers or pockets consisting primarily of shell fragments in the C horizon.

The A horizon is black, very dark gray, dark gray, dark grayish brown, very dark grayish brown, or gray. This horizon is 3 to 8 inches thick. The content of sand size, multicolored shell fragments ranges from about 5 to 35 percent by volume.

The C horizon is grayish brown, brown, yellowish brown, light brownish gray, pale brown, very pale brown, or light gray. The color of the horizon depends primarily on the color of the shell fragments. The content of shell fragments ranges from about 20 to 70 percent by volume. Thin, discontinuous layers of darker colored sands are in some pedons. These are remnants of old surfaces that developed during the formative stages of the beach ridge.

Palm Beach soils are geographically associated with Beaches and Canaveral soils. Beaches are on the shoreline and are flooded by wave action. Canaveral soils are similar to Palm Beach soils, but are at lower elevations and have a water table within a depth of 40 inches most of the time.

Pc—Palm Beach sand. This is a nearly level to sloping, excessively drained soil on narrow ridges along the coast. It has the profile described as typical of the series. Slopes are 0 to 8 percent.

Included with this soil in mapping are small areas of Canaveral soil and Urban land. Also included are soils along the lower slopes of the ridges that are similar to Palm Beach but are moderately well drained or well drained.

Small areas of this map unit are used for homes or other urban uses. Most areas remain in native vegetation consisting of cabbage palm, seagrape, sawpalmetto, cactus, and sea-oats and other grasses. This soil is not suited to cultivated crops or improved pasture. It is droughty, and plant nutrients are rapidly lost through leaching. This soil is well suited to home and building sites, but maintaining lawns and landscaping plants requires regular applications of water and fertilizers.

This soil is in capability subclass VIIs.

Pu—Palm Beach-Urban land complex. This complex consists of about 50 to 70 percent Palm Beach soils and 30 to 50 percent Urban land. The areas of these components are so intermixed or so small that mapping them separately was not practical. The Palm Beach soils are in open areas made up of lawns, vacant lots, parks, and playgrounds. The Urban land part is covered by streets, sidewalks, parking lots, and buildings to such a degree that the natural soil is not observable. Slopes are 0 to 8 percent.

Most of the acreage of the Palm Beach soils has been modified by grading or shaping or generally has been altered for community development (fig. 9). Although the soil can be recognized and is similar to that described as typical of the Palm Beach series, close investigation is difficult in most areas. In the older communities, the soil has generally not been altered as extensively as in the newer, more densely developed communities. The excavation of streets below the level of the original land surface and the spreading of the soil material over adjacent land areas is a common practice.

Figure 9.—Bridges lace the many miles of waterways that connect the mainland and the barrier islands. Palm Beach-Urban land complex is dominant on the islands.

Included with this complex in mapping are small areas of Arents and Canaveral soils.

Present land use precludes the use of the soils for crops, pasture, or trees. Most of the Palm Beach part of this map unit is used for lawn grasses and ornamentals. For satisfactory plant growth, regular applications of both water and fertilizer are needed.

This complex is not assigned to a capability subclass.

Paola Series

The Paola series consists of nearly level, excessively drained soils on low knolls and ridges that are part of the Atlantic Coastal Ridge in the northeastern part of the county. These soils formed in unconsolidated marine sediment. The water table is below a depth of 80 inches throughout the year.

Typically, the surface layer is gray fine sand about 4 inches thick. The subsurface layer is white fine sand about 22 inches thick. The subsoil, about 36 inches thick, is yellow fine sand. Light yellowish brown fine sand is between depths of 62 and 83 inches.

Permeability is very rapid in all layers of these soils. Available water capacity is very low in all layers. Natural fertility and content of organic matter are low.

These soils are unsuited to cultivated crops or citrus. They are poorly suited to improved pasture.

Typical pedon of Paola fine sand, 1,200 feet west of the east-west runway of Pompano Beach Airport, NW1/4NW1/4 sec. 36, T. 48 S., R. 42 E.:

A1—0 to 4 inches; gray (10YR 6/1) fine sand; single grained; loose; few fine and medium roots; very strongly acid; clear smooth boundary.

A2—4 to 26 inches; white (10YR 8/1) fine sand; few coarse distinct gray (10YR 5/1) and dark gray (10YR 4/1) mottles in root channels; single grained; loose; few coarse roots; very strongly acid; abrupt wavy boundary.

B2—26 to 62 inches; yellow (10YR 7/8) fine sand; single grained; loose; few tongues filled with light colored sand from the A2 horizon; outer edges of the tongues stained with very dark grayish brown (10YR 3/2) organic material that in places is weakly cemented; outer edges of the tongues are less than 2 inches thick; few coarse roots; very strongly acid; gradual wavy boundary.

C—62 to 83 inches; light yellowish brown (10YR 6/4) fine sand; many coarse distinct yellowish brown (10YR 5/8) mottles; single grained; loose; very strongly acid.

Paola soils are 80 inches or more in thickness. Reaction ranges from very strongly acid to strongly acid throughout. The A1 horizon is 2 to 5 inches thick and is dark gray, gray, or dark grayish brown. The A2 horizon is gray, light gray, or white and is 6 to 40 inches thick. The B horizon is yellow, brownish yellow, yellowish brown, or strong brown and is 12 to 40 inches thick. The tongues filled with A2 material are absent in some places. The C horizon is light yellowish brown, brown, pale brown, or very pale brown. It is mottled with darker or lighter colors in places.

Paolo soils are associated with Pomello and St. Lucie soils. They are better drained than Pomello soils and do not have the Bh horizon of those soils. They have a B horizon that is not present in St. Lucie soils.

Pa—Paola fine sand. This nearly level, deep, excessively drained, sandy soil is on low knolls and ridges that make up the Atlantic Coastal Ridge in the northeastern part of the county. It has the profile described as typical of the series.

Included with this soil in mapping are small areas of Immokalee fine sand, Pomello fine sand, and St. Lucie fine sand.

Most of the acreage of this soil is in natural vegetation that consists of sand pine, scrub live oak, and an undergrowth of cactus and native grasses.

This soil is unsuited to cultivated crops or citrus because it is droughty and has many other poor soil properties. Plant nutrients are lost rapidly through leaching. Improved pasture of fair quality can be produced under intensive management. Deep-rooted grasses that resist drought should be planted. In addition, large amounts of fertilizer and lime need to be applied frequently. Grazing should be delayed during initial development and controlled carefully thereafter.

This soil is in capability subclass VIs.

Pb—Paola-Urban land complex. About 55 to 75 percent of this complex consists of Paola soils, which are commonly in lawns, vacant lots, and playgrounds; and 20 to 45 percent consists of Urban land. The areas of Urban land are more than 70 percent covered by houses, streets, driveways, buildings, parking lots, and similar constructions; therefore, the natural soil in these areas is not readily observable.

The Paola soils have been modified by grading and shaping or generally altered for community development, and although they can be recognized and are similar to the soil described as typical of the Paola series, close investigation is difficult, and mapping them separately from Urban land is not feasible. In older communities, alteration of the soil has not been great; but more reworking and reshaping has taken place in the newer, more densely developed communities. Excavation of streets below the original land surface and the spreading of this excavated material over adjacent land areas, particularly narrow strips near roads, is a common practice.

Included with this complex in mapping are small areas of St. Lucie fine sand and Pomello fine sand.

The determined use of the soils in this complex for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Pennsuco Series

The Pennsuco series consists of nearly level, poorly drained and very poorly drained soils on coastal lowlands and in tidal swamps. These soils formed in calcareous, loamy sediment of marine or freshwater origin over porous limestone. Under natural conditions, tidal areas are flooded daily or periodically by tidal waters. In other areas, the water table is within a depth of 10 inches for 4 to 6 months in most years. It is at a depth of 10 to 30 inches most of the rest of the year. During very dry seasons it is within cavities in the limestone.

Typically, the surface layer is grayish brown silty clay loam about 5 inches thick. The subsoil is silt loam or silt to a depth of 38 inches. It is light brownish gray in the upper 6 inches, olive gray in the next 10 inches, and very pale brown in the next 7 inches. The lower 10 inches is a mixture of dark grayish brown and very pale brown. The upper 3 inches of the substratum is black fine sand, and the lower 12 inches is very dark gray fine sand. Soft, porous limestone is at a depth of about 53 inches.

Permeability is moderate to moderately rapid in the subsoil and rapid below. Available water capacity is high to very high in the loamy layers and medium in the sandy layers. Natural fertility and organic matter content are low to moderate. Tidal areas are slightly to moderately affected by salinity.

Where adequate water control and intensive management practices are in use, Pennsuco soils are suited to some nursery and truck crops. These soils are in areas that are under urban development and are not used for pasture. Tidal areas are unsuited to any agricultural use.

Typical pedon of Pennsuco silty clay loam, about 0.5 mile east of U.S. Highway 1 and 0.5 mile north of Dania Cut-Off Canal, about 100 feet south of paved road, NW1/4SW1/4SW1/4, sec. 26, T. 50 S., R. 42 E.:

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate fine to coarse granular structure;

friable; few fine and medium roots; few snail shells; strongly effervescent; moderately alkaline; clear wavy boundary.

B21—5 to 11 inches; light brownish gray (2.5Y 6/2) silt loam; few fine distinct light olive brown (2.5Y 5/6) mottles; moderate coarse subangular blocky structure; firm to friable; few fine and medium roots; strongly effervescent; moderately alkaline; clear wavy boundary.

B22—11 to 21 inches; olive gray (5Y 5/2) silt loam; moderate coarse subangular blocky structure; firm; few fine roots; common vertical black streaks in old root channels; common discontinuous lenses of very dark gray (5Y 3/1) and dark olive gray (5Y 3/2); common fine white fragments of shell; strongly effervescent; moderately alkaline; clear wavy boundary.

B23—21 to 28 inches; very pale brown (10YR 7/4) silt; many medium and coarse light brownish gray (10YR 6/2) mottles in upper few inches; few medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky structure; friable; common coarse vertical root channels 1 to 2 inches apart; strongly effervescent; moderately alkaline; gradual wavy boundary.

B3—28 to 38 inches; coarsely mixed dark grayish brown (2.5Y 4/2) and very pale brown (10YR 7/3) silt loam; weak medium to coarse subangular blocky structure; friable; common medium black vertical roots; many thin discontinuous lenses of grayish brown (10YR 5/2); common fine white fragments of shell; strongly effervescent; moderately alkaline; abrupt smooth boundary.

IIC1—38 to 41 inches; black (10YR 2/1) fine sand; massive; friable; many medium roots; moderately alkaline; gradual wavy boundary.

IIC2—41 to 53 inches; very dark gray (10YR 3/1) fine sand; massive; very friable; common medium roots; common clean sand grains; moderately alkaline; abrupt wavy boundary.

IICr—53 to 80 inches; very pale brown, soft, porous limestone that has a thin mat of roots on the surface.

The thickness of the soil ranges from 40 to 72 inches or more. The A and B horizons are moderately alkaline and calcareous, and the IIC horizon is neutral to moderately alkaline.

The A or Ap horizon is very dark gray, very dark grayish brown, dark grayish brown, and grayish brown. Thickness ranges from 2 to 10 inches. A thin layer of organic material covers the A horizon in some pedons.

The B horizon ranges in color from light gray to very dark gray, very dark grayish brown to brown, or yellowish brown to olive brown with or without mottles. Many pedons do not have one or more of the subhorizons present in the typifying pedon, and there is no orderly sequence of the subhorizons. In some pedons many high chroma mottles in the upper B horizon tend to mask the matrix color.

Some pedons have a C horizon. Where present, it is very similar to the lower part of the B horizon but does not have structure. Thickness ranges from 10 to 42 inches. Some pedons have masses or thin, discontinuous lenses of muck or mucky silt loam in or below the C horizon.

The IIC horizon is black, very dark brown, very dark gray, very dark grayish brown, dark grayish brown, gray, or grayish brown. Texture is sand, fine sand, or loamy sand. Thickness ranges from 0 to 18 inches.

The IICr horizon is limestone that ranges from soft to hard and is many feet thick. The surface is smooth to wavy or irregular. Solution holes are few to common and extend less than 2 to 3 feet into the rock. Sand, silt loam, or soft marl (carbonatic material) fills the solution holes and cavities in the limestone.

Pennsuco soils are associated with Dade, Perrine, and Perrine Variant soils. Dade soils are well drained, sandy soils on higher lying terrain. Perrine soils have limestone at a depth of 20 to 40 inches. Perrine Variant soils overlie thick layers of organic materials.

Pe—Pennsuco silty clay loam. This is a nearly level, poorly drained and very poorly drained, loamy soil underlain by limestone at a depth of more than 40 inches. It is primarily on coastal lowlands east of the Atlantic Coastal Ridge and extending south from Ft. Lauderdale.

Included with this soil in mapping are small areas of similar soils that have less than 20 inches of fill material on the surface, and similar soils that do not have limestone within a depth of 72 inches. Also included are small areas of Pennsuco tidal, Perrine, and Perrine Variant soils.

The natural vegetation consists of American mangrove, white mangrove, sawgrass, giant leatherfern, bushy sea-oxeye, and glasswort. Some areas have a dense cover of Brazilian pepper. Some areas are used for vegetable and nursery crops.

Under natural conditions, this soil is severely limited for cultivated crops by excessive wetness and other poor soil qualities. If water control, proper fertilization, and good management are used, this soil is moderately well suited to vegetable crops and other special crops.

This soil is found in areas where land use is primarily urban. This soil is severely limited for such uses unless it is adequately drained and filled with stable soil material.

This soil is in capability subclass IIIw.

Pf—Pennsuco silty clay loam, tidal. This is a nearly level, very poorly drained, loamy soil that is underlain by limestone at a depth of more than 40 inches. It is found in tidal swamps in southeastern Broward County from Port Everglades southward.

Included with this soil in mapping are small areas of similar soils with a thin covering of organic material or gravelly sand fill material. Also included are small spots of Pennsuco, Perrine, and Perrine Variant soils.

The natural vegetation consists mainly of American mangrove, white mangrove, and scattered areas of giant leatherfern, sawgrass, bushy sea-oxeye, and glasswort. Australian pine is scattered through areas that have thin coverings of fill materials.

This soil is adversely affected by daily or frequent tidal flooding and low to moderate salinity. This soil is unsuited to either agricultural or urban uses. It is best used in its natural condition as habitat for marine life and waterfowl.

This soil is in capability subclass VIIIw.

Perrine Series

The Perrine series consists of nearly level, poorly drained soils on coastal lowlands. These soils formed in calcareous, loamy sediment of marine or freshwater origin over limestone, which is at a depth of 20 to 40 inches. Under natural conditions, the water table is within 10 inches of the surface about 30 to 50 percent of the time. The level is probably highest from June to November. The water table is within a depth of 10 inches for 2 to 6 months in most years, and at a depth of 10 to 30 inches for most of the rest of each year.

Typically, the surface layer is dark grayish brown silty clay loam about 10 inches thick. The subsoil is 10 inches of light brownish gray silt loam. Next is 6 inches of grayish brown silt. Limestone is at a depth of about 26 inches.

Permeability is moderate to moderately slow in the surface layer and moderate to moderately rapid in other horizons. The available water capacity is high to very high. Organic matter content and natural fertility are low to medium.

Where adequate water control and intensive management practices are used, Perrine soils are suited to some truck crops and nursery stock.

Typical pedon of Perrine silty clay loam in a cleared powerline right-of-way about 0.7 mile east of U.S. Highway 1 and Ft. Lauderdale International Airport; 0.2 mile north of the Dania Cutoff Canal and about 200 feet north of boat yard and 200 feet west of the paved entrance road, NE1/4NW1/4NW1/4, sec. 35, T. 50 S., T. 50 S., R. 42 E.:

A—0 to 10 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few medium distinct very dark grayish brown (2.5Y 3/2) mottles; moderate medium granular structure; friable; common fine and medium roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

B—10 to 20 inches; light brownish gray (2.5Y 6/2) silt loam; few fine and medium distinct light olive brown (2.5Y 5/4, 5/6) mottles; weak coarse subangular blocky structure; slightly sticky; few fine roots; few small pockets of very dark grayish brown (2.5Y 3/2) and grayish brown (2.5Y 5/2) silt loam; few fine fragments of shell; strongly effervescent; moderately alkaline; clear smooth boundary.

C—20 to 26 inches; very dark grayish brown (2.5Y 3/2) silt; dark grayish brown (2.5Y 4/2) in part; massive; slightly sticky; few small pockets and streaks of black; few to common fine fragments of shell and small white carbonate nodules; strongly effervescent; moderately alkaline; abrupt irregular boundary.

IICr—26 to 30 inches; soft to hard very pale brown limestone with a few inches of limestone fragments mixed with a matrix of almost liquid carbonates on the rock surface.

Soil thickness ranges from 20 to 40 inches. Soil reaction is moderately alkaline.

The A or Ap horizon ranges in color from very dark gray to gray or from very dark grayish brown to brown. It may or may not have mottles in shades of gray, brown, or yellow. Thickness ranges from 4 to 12 inches.

The B horizon ranges from very dark gray to gray or from very dark grayish brown to very pale brown. It may or may not have mottles in shades of gray, brown, or yellow. Texture is silt loam or silt. Thickness ranges from 8 to 20 inches.

The C horizon has about the same color range as the B horizon, and differs mainly by not having structure. Texture is silt loam or silt. Thickness of the C horizon ranges from 5 to 10 inches. Some pedons have a thin layer of black muck or fine sand ranging from black to brown or dark gray at the base of the C horizon.

The IICr horizon is soft to hard, pale brown or very pale brown limestone that has a wavy or irregular surface. Solution holes are few to common. They extend 1 to 2 feet below the rock surface and are filled with sand, silt loam, or soft carbonatic material.

Perrine soils are associated with Pennsuco and Perrine Variant soils. They are similar to the Pennsuco soils, but have limestone at a depth of 20 to 40 inches. They do not have underlying layers of organic materials as do the Perrine Variant soils.

Ps—Perrine silty clay loam. This is a nearly level, poorly drained, loamy soil underlain by limestone at a depth of 20 to 40 inches. It is on coastal lowlands and in brackish swamps in the southeastern part of the survey area.

Included with this soil in mapping are small areas of similar soils that have a thin layer of organic material on the surface or that have limestone at a depth of less than 20 inches. Also included are small areas of Pennsuco and Perrine Variant soils.

The natural vegetation includes sawgrass, sedges, reeds, various grasses, and scattered palm trees. Areas nearest the coast include American mangrove and white mangrove trees. Some areas are used for truck crops and plant nurseries.

This soil is severely limited for cultivated crops by excessive wetness and poor soil qualities. If water is adequately controlled and the soil is managed at a high level, it is moderately well suited to locally grown vegetable crops and ornamentals. This soil is poorly suited to most urban uses unless it is adequately drained and filled with stable soil material.

This soil is in capability subclass IIIw.

Perrine Variant

The Perrine Variant consists of nearly level, very poorly drained soils in flatlands and swamps near the coast in the southeastern part of the survey area. These soils formed in loamy marine sediment deposited over thick beds of decomposed, hydrophytic plant remains. Under natural conditions, these soils are flooded by shallow water for long periods. The water table is within a depth of 10 inches for 2 to 6 months in most years. It is within a depth of 10 to 30 inches for most of the rest of each year.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Between depths of 8 and 26 inches are layers of grayish brown and very dark grayish brown silt loam. Below this, to a depth of 80 inches or more, are layers of black and dark reddish brown, well decomposed organic materials.

Permeability is moderately slow to moderate in the surface layer, moderate to moderately rapid between depths of 8 and 26 inches, and rapid in the organic layers. Available water capacity is very high to high. Natural fertility is moderate. Some of these soils have slight to moderate salinity.

Where adequate water control and intensive management practices are used, Perrine Variant soils are suited to some nursery and vegetable crops. These soils are in areas that are under urban development and are not used for pasture.

Typical pedon of Perrine Variant silt loam on the south side of a paved road, about 500 feet east of motel on U.S. Highway 1 near Ft. Lauderdale International Airport, NE1/4 sec. 27, T. 50 S., R. 42 E.:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; moderate coarse granular structure; friable; common fine and medium roots; strongly effervescent; moderately alkaline; clear wavy boundary.

B—8 to 17 inches; grayish brown (2.5Y 5/2) silt loam; few coarse faint dark grayish brown (10YR 4/2) and few medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; friable; few fine and medium roots; strongly effervescent; moderately alklaine; abrupt wavy boundary.

C—17 to 26 inches; very dark grayish brown (10YR 3/2) silt loam; massive; slightly sticky; few fine fragments of shell; strongly effervescent; moderately alkaline; abrupt wavy boundary.

IIOa1—26 to 32 inches; black (10YR 2/1) muck; massive; estimated 10 to 15 percent fiber unrubbed, less than 5 percent rubbed; sodium pyrophosphate extract color very dark brown (10YR 3/3); moderately alkaline; gradual wavy boundary.

IIOa2—32 to 70 inches; dark reddish brown (5YR 3/2) muck; massive; estimated 50 to 60 percent fiber unrubbed, 15 percent rubbed; sodium pyrophosphate extract color brown (10YR 5/3); moderately alkaline; diffuse boundary.

IIOa3—70 to 80 inches; black (10YR 2/1) muck; massive; estimated 50 percent fiber unrubbed, less than 10 percent rubbed; sodium pyrophosphate extract color brown (10YR 4/3); common coarse vertical fibers or old roots; moderately alkaline.

Soil reaction is moderately alkaline in all horizons. Mineral horizons are 20 to 48 inches thick and are calcareous. The IIOa horizon is at a depth of more than 20 inches.

The Ap or A horizon ranges in color from very dark brown to grayish brown or from very dark gray to gray. Texture is silt loam or silty clay loam. Thickness ranges from 4 to 12 inches.

The B horizon ranges in color from dark brown to pale brown or from very dark gray to light gray. It may or may not have mottles in shades of gray, brown, or yellow. Texture is silt loam or silt. Thickness ranges from 8 to 20 inches.

The C horizon has about the same characteristics as the B horizon and differs mainly by not having structure. Texture is silt loam or silt. Thickness ranges from 8 to 24 inches.

The IIOa horizon is black, very dark gray, very dark grayish brown, or dark reddish brown. In some pedons, this horizon has a high fiber content in some parts. Thickness of the Oa horizon ranges from 15 to more than 60 inches.

Some pedons have a IIIC horizon consisting of sand or silt loam at a depth of more than 60 inches. If the horizon is sandy, colors are black, very dark brown, dark grayish brown, or dark gray. If it is silty, colors are similar to those of the B horizon.

Perrine Variant soils are geographically closely associated with Pennsuco soils. Pennsuco soils do not overlie organic materials and have limestone at a depth of more than 40 inches. Perrine Variant soils are also associated with Dade soils, which are much better drained and do not have organic materials.

Pv—Perrine Variant silt loam. This is a nearly level, very poorly drained soil that has 18.to 48 inches of calcareous silt loam (marl) over well decomposed organic materials. This soil is on coastal lowlands and in swamps in the southeastern part of the county.

Included with this soil in mapping are small areas of soils similar to Perrine Variant soils that have limestone at a depth of more than 40 inches. Also included are small areas of Pennsuco and Perrine soils.

The natural vegetation consists of red mangrove, white mangrove, giant leatherfern, bushy sea-oxeye, glasswort, and salt-tolerant grasses. Some areas of this soil have been drained and protected from flooding and are used for nursery and truck crops.

Under natural conditions, this soil is severely limited for cultivated crops by excessive wetness and alkalinity. If adequately drained and protected from flooding, and properly fertilized, this soil is moderately well suited to some vegetable crops and special crops.

This soil is in coastal areas under urban development. Adequate drainage and filling with stable soil material are needed to make the soil suited to some urban uses.

This soil is in capability subclass VIIIw.

Plantation Series

The Plantation series consists of nearly level, very poorly drained soils in broad flats along the eastern edge of the Everglades. These soils formed in unconsolidated sandy marine sediment. Under natural conditions they are covered by water most of the year. Even where drainage has been improved, there are times when water stands on the surface for a few days. During most years the water table is at a depth of 10 inches or less for 2 to 6 months and at a depth of 20 inches or less the rest of the year.

Typically, a layer of sapric material, or muck, about 10 inches thick covers the surface. It is black in the upper 4 inches and dark reddish brown in the lower 6 inches. The mineral surface layer is dark gray fine sand about 6 inches thick. Below this is a layer of light gray fine sand about 12 inches thick that has black mottles, 5 inches of pale brown fine sand that has mottles of very dark gray and light gray, and 2 inches of pale brown fine sandy loam that is about 50 percent limestone fragments. Limestone rock is 35 inches below the surface of the muck and 25 inches below the top of the mineral surface layer.

Permeability is rapid in all layers of these soils. Available water capacity is very high in the muck layers and very low in the sandy layers. Natural fertility is moderate. Content of organic matter is very high in the muck layers and low in the mineral surface layer.

Where adequate water control and good management practices are in use, Plantation soils are suited to winter truck crops and improved pasture.

Typical pedon of Plantation muck, about 520 feet west of Snake Creek Road and 1.1 miles north of Canal number 9, NW1/4SE1/4NE1/4 sec. 26, T. 51 S., R. 40 E.:

Oa1—10 to 6 inches; black (N 2/0), rubbed and unrubbed, sapric material; 6 percent fiber; 50 percent mineral material; weak fine subangular blocky structure; friable; few fine and medium roots; pale brown (10YR 6/3) sodium pyrophosphate extract; strongly acid (pH 5.3 in 0.01*M* calcium chloride); clear smooth boundary.

Oa2—6 inches to 0; dark reddish brown (5YR 2/2), rubbed and unrubbed, sapric material; 10 percent fiber; 37 percent mineral material; weak medium subangular blocky structure; friable; few medium roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; strongly acid (pH 5.4 in 0.01*M* calcium chloride); clear wavy boundary.

IIA1—0 to 6 inches; dark gray (10YR 4/1) fine sand; many coarse distinct gray (10YR 6/1) mottles and streaks; single grained; loose; many uncoated sand grains; medium acid; gradual wavy boundary.

IIA2—6 to 18 inches; light gray (10YR 7/1) fine sand; common medium distinct black (10YR 2/1) mottles; single grained; loose; many uncoated sand grains; cyclic thickness of 7 to 28 inches; slightly acid; gradual wavy boundary.

IIC1—18 to 23 inches; pale brown (10YR 6/3) fine sand; common medium distinct very dark gray (10YR 3/1) and common coarse distinct light gray (10YR 7/2) mottles; single grained; loose; some partly coated and very thinly coated and common clean sand grains; mildly alkaline; abrupt irregular boundary.

IIC2—23 to 25 inches; pale brown (10YR 6/3) fine sandy loam; weak fine subangular blocky structure; friable; about 50 percent limestone fragments that are very pale brown (10YR 7/3) and yellow (10YR 8/6); moderately alkaline; abrupt irregular boundary.

IIIR—25 inches; hard fractured limestone that can be excavated using power equipment.

Above the limestone the profile ranges from 28 to 56 inches in thickness, but solution pits are more than 60 inches deep. Reaction is strongly acid to slightly acid in the organic material, in 0.01*M* calcium chloride, and slightly acid to moderately alkaline in the mineral material.

The Oa1 horizon is black or dark reddish brown and is 1 to 12 inches thick. The Oa2 horizon is dark reddish brown or very dark brown and is 4 to 12 inches thick.

The IIA1 horizon is dark gray, black, very dark gray, or gray and is 4 to 8 inches thick. The IIA2 horizon is light gray, gray, dark gray, or light brownish gray and is 8 to 20 inches thick.

The IIC1 horizon is brown, yellowish brown, pale brown, or very pale brown and is 5 to 10 inches thick. In many places this horizon has very dark gray, black, or dark gray mottles or black, very dark brown, or dark reddish brown weakly cemented fragments. The IIC2 horizon is pale brown, brown, or yellowish brown and is 0 to 4 inches thick. It is fine sand to fine sandy loam, and is about 40 to 60 percent pale brown or yellow limestone fragments.

The IIR horizon is limestone that has solution pits of varying depth and width.

Plantation soils are associated with Boca, Dania, Hallandale, and Margate soils. They have an organic surface layer that is not present in Boca, Hallandale, and Margate soils. They do not have the loamy B horizon of Boca soils. They are deeper to limestone than Dania and Hallandale soils.

Pm—Plantation muck. This is a nearly level, very poorly drained soil that has a muck surface layer over sandy mineral material. It is in broad flats along the eastern edge of the Everglades. The organic surface layer is subject to oxidation, which decreases its amount of organic material each year.

Included with this soil in mapping are a few small areas of Dania muck, Lauderhill muck, Margate fine sand, and Hallandale fine sand.

Most areas of this soil are in natural vegetation that consists of sawgrass, paspalum, maidencane, and cutthroat grass. In some areas that have been burned, melaleuca and myrtle have become established. Some areas that have adequate water control are used for improved pasture.

In its natural condition, this soil is very severely limited for cultivated crops and pasture because of excessive wetness and ponding. It is unsuited to citrus. The water table is generally controlled by existing ditches. Where adequate water control and proper management are in use, this soil is well suited to winter truck crops and improved pasture grasses or to grass and clover. After drainage and the initial subsidence caused by compaction, subsidence by oxidation is a continual hazard. Thus, structures are needed that hold the water level at the proper depth for crops and that permit flooding of the soil when it is left idle. In addition, fertilizer that is high in all plant nutrients except nitrogen should be applied frequently. Lime is needed in some places. Grazing needs to be controlled on improved pasture.

This soil is in capability subclass IIIw in areas where drainage outlets are available and reclamation is feasible. Small areas without drainage outlets are in capability subclass VIIw.

Pomello Series

The Pomello series consists of nearly level to gently sloping, moderately well drained soils on low ridges east of the Everglades. These soils formed in unconsolidated marine sands. In most years the water table is at a depth of 24 to 40 inches for 2 to 4 months and between depths of 40 and 60 inches most of the rest of the year.

Typically, the surface layer is dark gray fine sand about 5 inches thick. The subsurface layer is 33 inches of fine sand. The upper 3 inches is light gray and the lower 30 inches is white. The subsoil extends to a depth of 80 inches. The upper 14 inches is black fine sand, the next 20 inches is dark reddish brown fine sand, and the lower 8 inches is dark reddish brown fine sand.

Permeability is very rapid to a depth of about 38 inches, moderate between depths of 38 and 72 inches, and rapid between depths of 72 and 80 inches. Available water capacity is very low to a depth of 38 inches, medium or high between depths of 38 and 72 inches, and very low between depths of 72 and 80 inches. Natural fertility and content of organic matter are low.

These soils are unsuited to cultivated crops or citrus. They are poorly suited to improved pasture.

Typical pedon of Pomello fine sand, 0.9 mile south of State Road 84 and 0.85 mile west of Pine Island Road, SE1/4SW1/4 sec. 17, T. 50 S., R. 41 E.:

A1—0 to 5 inches; dark gray (10YR 4/1) fine sand; single grained; loose; many fine and medium and few large roots; very strongly acid; smooth wavy boundary.

A21—5 to 8 inches; light gray (10YR 6/1) fine sand; few fine faint dark gray (10YR 4/1) mottles in root channels; single grained; loose; few fine and medium roots; very strongly acid; clear smooth boundary.

A22—8 to 38 inches; white (10YR 8/1) fine sand; few fine faint gray (10YR 6/1) streaks in root channels; single grained; loose; few fine and medium roots; very strongly acid; gradual wavy boundary.

B21h—38 to 52 inches; black (10YR 2/1) fine sand; many light gray (10YR 7/1) uncoated sand grains; massive in place, parting to weak medium granular structure; friable; few fine and medium roots; very strongly acid; gradual wavy boundary.

B22h—52 to 72 inches; dark reddish brown (5YR 3/2) fine sand; common distinct black (10YR 2/1) organic coated sand grains; massive in place, parting to weak fine granular structure; friable; very strongly acid; gradual wavy boundary.

B3—72 to 80 inches; dark reddish brown (5YR 3/4) fine sand; common black (10YR 2/1) organic coated sand grains; single grained; loose; very strongly acid.

The solum is 80 inches or more in thickness. Reaction ranges from extremely acid to strongly acid throughout.

The A1 horizon is black, dark gray, or very dark gray and is 3 to 6 inches thick. The A21 and A22 horizons are gray, light gray, or white and have a combined thickness of 24 to 46 inches.

The B2h horizon is black or dark reddish brown. The B21h horizon is 6 to 16 inches thick, and the B22h horizon is 8 to 24 inches thick. The B3 horizon is dark brown or dark reddish brown or dark yellowish brown and extends to a depth of 80 inches or more.

Pomello soils are associated with Duette, Immokalee, Margate, Paola, and St. Lucie soils. They have a Bh horizon at a depth of 30 to 50 inches, whereas in the Duette soils this horizon is at a depth of 50 to 80 inches. They are better drained than Immokalee soils. They have a Bh horizon, whereas Margate, Paola, and St. Lucie soils do not. In addition, Paola and St. Lucie soils are excessively drained.

Po—Pomello fine sand. This is a nearly level to gently sloping, deep, moderately well drained, sandy soil that has a layer well coated with organic matter at a depth of 30 to 50 inches. It is on low ridges east of the Everglades. Slopes are 0 to 5 percent.

Included with this soil in mapping are small areas of a moderately well drained soil that does not have a subsoil that has an accumulation of organic matter. Also included are small areas of Duette, Immokalee, and St. Lucie soils.

The natural vegetation consists of pine, palmetto, live oak, and native grasses.

This soil is poorly suited to cultivated crops or citrus. Even under intensive management, it is too droughty and leaches too rapidly for good growth of most crops. Where intensive management practices are in use, improved deep-rooted pasture grasses and citrus of fair quality can be produced. Large amounts of fertilizer should be applied frequently, and lime is also needed. Grazing should be delayed during initial development and controlled carefully thereafter. Good yields of citrus can be obtained some years without irrigation, but for best yields irrigation is needed.

This soil is in capability subclass VIs.

Pompano Series

The Pompano series consists of nearly level, poorly drained soils in sloughs and broad flats. These soils formed in thick beds of marine sand. Under natural conditions they may be covered with shallow water after heavy rains. Under improved drainage they are not. During most years, the water table is at a depth of 10 inches or less for 2 to 6 months and at a depth of 30 inches or less most of the rest of the year.

Typically, the surface layer is gray fine sand about 7 inches thick. Below this is gray and light gray fine sand to a depth of 43 inches. Brown fine sand is at a depth of 43 to 80 inches.

Permeability is very rapid in all layers of these soils. Available water capacity is very low in all layers. Natural fertility and content of organic matter are low.

Where adequate water control and good management practices are in use, Pompano soils are suited to winter truck crops and improved pasture grasses.

Typical pedon of Pompano fine sand, 1.25 miles east of the Turnpike and 0.5 mile north of Prospect Road, SW1/4NE1/4 sec. 8, T. 49 S., R. 48 E.:

A1—0 to 7 inches; gray (10YR 5/1), crushed and rubbed, fine sand; organic matter and gray fine sand have a salt-and-pepper appearance; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary.

C1—7 to 17 inches; gray (10YR 6/1) fine sand; few fine faint white (10YR 8/1) mottles; single grained; loose; few fine and medium roots; very strongly acid; gradual smooth boundary.

C2—17 to 35 inches; light gray (10YR 7/1) fine sand; common medium distinct very dark gray (10YR 3/1) streaks in root channels; single grained; loose; few coarse roots; very strongly acid; gradual wavy boundary.

C3—35 to 43 inches; light gray (10YR 7/2) fine sand; many medium distinct very dark grayish brown (10YR 3/2) mottles in root channels and few fine faint white (10YR 8/1) mottles; single grained; loose; very strongly acid; gradual wavy boundary.

C4—43 to 80 inches; brown (10YR 5/3) fine sand; many medium distinct very dark grayish brown (10YR 3/2) mottles in root channels; single grained; loose; very strongly acid.

Pompano soils are more than 80 inches thick. Reaction ranges from very strongly acid to strongly acid throughout.

The A1 or Ap horizon is black, dark gray, very dark gray, or gray and is 2 to 8 inches thick.

The C1 horizon is gray, grayish brown, light brownish gray, or dark grayish brown and is 8 to 20 inches thick. The C2 horizon is light brownish gray, grayish brown, brown, or light gray and is 2 to 20 inches thick. The C3 and C4 horizons are light brownish gray, pale brown, brown, grayish brown, or light gray. The C3 horizon is 8 to 20 inches thick, and the C4 horizon is 15 to 40 inches thick or more.

Pompano soils are associated with Basinger, Immokalee, Margate, and Sanibel soils. They do not have the C&Bh horizon of Basinger soils or the Bh horizon of Immokalee soils. They are more than 80 inches deep, whereas Margate soils have limestone bedrock at a depth of 20 to 40 inches. They do not have the organic surface layer of Sanibel soils.

Pp—Pompano fine sand. This is a nearly level, deep, poorly drained, sandy soil in sloughs and broad flats in the eastern part of the survey area. Included in mapping are small areas of Immokalee fine sand, Basinger fine sand, and Margate fine sand.

The natural vegetation consists of pepper, slash pine, and guava trees and native grasses. Cypress is scattered in some lower lying areas.

This soil is severely limited for cultivated crops by wetness and other adverse soil properties. Winter truck crops and improved pasture grasses or a mixture of grass and clover can be grown where adequate water control and fertilization and intensive management are in use. This soil responds well to applications of complete fertilizer, including minor elements, and lime. It is severely limited for citrus. If it is used for citrus, very intensive management practices and adequate water control are needed.

This soil is in capability subclass IVw.

Sanibel Series

The Sanibel series consists of nearly level, very poorly drained soils in ponds, drainageways, and low, broad flats. These soils formed in thick beds of sand beneath a thin mantle of organic material. Under natural conditions they are covered by shallow water for 2 to 6 months, but where drainage has been improved they are not. The water table is at a depth of less than 10 inches for 6 to 12 months during most years.

Typically, a layer of sapric material, or muck, about 9 inches thick covers the surface. It is black in the upper 2 inches and dark reddish brown in the lower 7 inches. The mineral surface layer is black fine sand mixed with organic material and is about 1 inch thick. The next layer is grayish brown fine sand about 8 inches thick, and below this is a layer of light gray fine sand about 51 inches thick or more.

Permeability is rapid in all layers of these soils. Available water capacity is very high in the muck layers and medium in the sandy layers. Content of organic matter is very high in the muck layers and low in the sandy mineral surface layer. Natural fertility is moderate.

Where adequate water control and good management practices are used, the Sanibel soils are suited to winter truck crops, improved pasture grasses and clover, and citrus.

Typical pedon of Sanibel muck, 1.5 miles north of Hollywood Boulevard and 0.1 mile west of WGMA Radio Station on Palm Avenue, SW1/4SW1/4 sec. 5, T. 51 S., R. 41 E.:

Oa1—9 to 7 inches; black (N 2/0) sapric material; 5 percent fiber; weak medium granular structure; friable; many fine and medium roots; about 55 percent mineral material; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; medium acid (pH 5.8 in 0.01*M* calcium chloride); clear smooth boundary.

Oa2—7 inches to 0; dark reddish brown (5YR 2/2) sapric material; 5 percent fiber; weak medium subangular blocky structure; very friable; few fine roots; about 48 percent mineral material; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; strongly acid (pH 5.5 in 0.01*M* calcium chloride); gradual wavy boundary.

IIA—0 to 1 inch; black (10YR 2/1) fine sand mixed with well decomposed organic material; weak medium crumb structure; very friable; few fine roots; medium acid; gradual wavy boundary.

IIC1—1 to 9 inches; grayish brown (10YR 5/2) fine sand; few fine faint dark grayish brown (10YR 4/2) mottles; single grained; loose; few fine roots; medium acid; gradual wavy boundary.

IIC2—9 to 60 inches; light gray (10YR 7/1) fine sand; common medium distinct dark brown (10YR 3/3) mottles in root channels; single grained; loose; medium acid.

Sanibel soils are 60 inches or more in thickness. Reaction ranges from strongly acid to neutral throughout.

The Oa horizon is 8 to 16 inches thick. The Oa1 horizon is black sapric material. The Oa2 horizon is dark reddish brown or black sapric material. This horizon is absent in some places.

The IIA horizon is grayish brown, dark grayish brown, gray, dark gray, or black. This horizon is 1 to 4 inches thick.

The IIC horizon is gray, light gray, white, light brownish gray, or grayish brown. The IIC1 horizon is 7 to 20 inches thick. The IIC2 horizon extends to a depth of 60 inches or more below the surface of mineral soil.

Sanibel soils are associated with Basinger, Immokalee, Margate, Plantation, and Pompano soils. They have an organic surface layer that Basinger, Immokalee, Margate, and Pompano soils do not have. Sanibel soils do not have the C&Bh horizon of Basinger soils or the Bh horizon of Immokalee soils, nor do they have limestone bedrock as do Margate and Plantation soils.

Sa—Sanibel muck. This is a nearly level, deep, very poorly drained soil that has a muck surface layer over sandy mineral material. It is in ponds, drainageways, and low, broad flats in the eastern part of the county.

Included with this soil in mapping are small areas of Dania muck, Lauderhill muck, Plantation muck, Okeelanta muck, and Margate fine sand. Also included are a few small areas of soils that are similar to Sanibel muck but have a dark grayish brown underlying layer.

The natural vegetation consists of sawgrass. In some areas where the sawgrass has been burned, melaleuca and myrtle have become established. About 75 percent of the acreage of this soil has adequate water control and is used for citrus production and improved pasture.

In its native state, this soil is unsuited to cultivated crops, citrus, or improved pasture grasses because of wetness and flooding. Where adequate water control and good management practices are in use, this soil is suited to winter truck crops, citrus, and improved pasture grasses and clover. After drainage, subsidence caused by oxidation is a continual hazard. Structures are needed that hold the water level at the proper depth for crops and that permit flooding of the soil when it is idle. In addition, large amounts of fertilizer that is high in all plant nutrients except nitrogen should be applied frequently. Lime is needed in places. Grazing needs to be controlled in pasture areas.

This soil is in capability subclass IIIw.

St. Lucie Series

The St. Lucie series consists of nearly level, excessively drained soils on low knolls and ridges in the eastern part of the county. These soils formed in thick beds of marine sand. The water table is below a depth of 80 inches.

Typically, the surface layer is gray fine sand about 4 inches thick. White fine sand is between depths of 4 and 82 inches. Below this to a depth of 94 inches is white fine sand mottled with brown.

Permeability is very rapid throughout these soils. Available water capacity is very low in all layers. Natural fertility and content of organic matter are low.

St. Lucie soils are unsuited to cultivated crops or citrus and have only limited suitability for improved pasture.

Typical pedon of St. Lucie fine sand, 400 feet south of Cypress Creek Road and 3,320 feet west of NW 12th Avenue, NE1/4NE1/4SW1/4 sec. 9, T. 49 S., R 42 E.:

A1—0 to 4 inches; gray (10YR 5/1) fine sand; single grained; loose; few fine and medium roots; strongly acid; clear wavy boundary.

C1—4 to 9 inches; white (10YR 8/1) fine sand; common medium distinct gray (10YR 5/1) and dark gray (10YR 4/1) streaks along root channels; single grained; loose; few coarse roots; strongly acid; gradual wavy boundary.

C2—9 to 82 inches; white (10YR 8/1) fine sand; single grained; loose; few coarse roots; strongly acid; gradual wavy boundary.

C3—82 to 94 inches; white (10YR 8/1) fine sand; few fine faint brown (10YR 4/3) and dark yellowish brown (10YR 4/4) mottles; single grained; loose; strongly acid.

St. Lucie soils are 80 or more inches deep. Reaction ranges from very strongly acid to strongly acid throughout. The A1 horizon is gray or light gray and is 2 to 5 inches thick. The C horizon is white or light gray. This horizon has mottles in shades of gray, yellow, or brown below a depth of 40 inches in some places.

St. Lucie soils are associated with Paola and Pomello soils. They do not have the B horizon of Paola soils or the Bh horizon of Pomello soils. They are excessively drained, whereas Pomello soils are moderately well drained.

St—St. Lucie fine sand. This is a nearly level, deep, excessively drained, sandy soil on low knolls and ridges in the eastern part of the county. Included in mapping are small areas of Immokalee fine sand, Pomello fine sand, and Paola fine sand.

The natural vegetation consists of sand pine, scrub oak, a few palmetto, and cactus.

This soil has properties that make it unsuited to cultivated crops and citrus and very limited for use as improved pasture. Pasture grasses are hard to maintain and grow poorly because of droughtiness and infertility. Fertilizers leach rapidly.

This soil is in capability subclass VIIs.

Terra Ceia Series

The Terra Ceia series consists of nearly level, very poorly drained organic soils in coastal swamps in the southeastern part of the survey area. These soils formed in thick deposits of hydrophytic plant remains. Under natural conditions, these soils are flooded daily or periodically by salty or brackish water.

Typically, the surface layer is black muck about 12 inches thick. Between depths of 12 and 66 inches is dark reddish brown muck that has more fibrous material and in which the sand content increases in the lower few inches. Below this is grayish brown sand to a depth of 80 inches or more.

Permeability is rapid in these soils. Available water capacity is very high. Natural fertility is moderate, but the soil is affected by salinity. If drained, these soils oxidize, which causes the amount of organic material to decrease each year.

Under natural conditions, these soils are unsuited to agricultural or urban uses. They are best used as habitat for marine wildlife and waterfowl.

Typical pedon of Terra Ceia muck, tidal, on the barrier island in the State Recreation Area, on the east side of the entrance road, about 1.1 miles south of the inlet at Port Everglades, NE1/4NE1/4NW1/4 sec. 25, T. 50 S., R. 42 E.:

Oa1—0 to 12 inches; black (10YR 2/1) sapric material; 15 percent fiber unrubbed, less than 5 percent rubbed; massive; dark brown (10YR 3/3) sodium pyrophosphate extract; moderately alkaline; gradual wavy boundary.

Oa2—12 to 66 inches; dark reddish brown (5YR 2/2) sapric material; about 45 percent fiber unrubbed, less than 15 percent rubbed; massive; brown (10YR 5/3) sodium pyrophosphate extract; moderately alkaline; gradual wavy boundary.

IIC—66 to 80 inches; grayish brown (2.5Y 5/2) sand; single grained; loose; streaks and pockets of black muck in upper few inches; moderately alkaline.

The thickness of the organic material and the depth to mineral material are more than 51 inches. Depth is commonly more than 60 inches. Soil reaction ranges from neutral to moderately alkaline in 0.01*M* calcium chloride.

The Oa1 horizon is black, very dark brown, or dark reddish brown. Fiber content in this horizon is less than 10 to 20 percent unrubbed and less than 5 percent rubbed. Mineral content in most pedons is less than 10 percent, but in areas where these soils are adjacent to spoil deposited from dredging of the Intracoastal Waterway, the mineral content may range to 40 percent. Thickness of the Oa1 horizon ranges from 4 to 18 inches.

The Oa2 horizon has nearly the same color range as the Oa1 horizon. Fiber content ranges from 25 to 50 percent unrubbed but is less than 15 percent after rubbing. Mineral content ranges from about 10 to 40 percent. Commonly marl content increases considerably in the lower part of this horizon. Thickness of the Oa2 horizon ranges from 40 to 60 inches.

The IIC horizon is black, very dark gray, very dark grayish brown, dark gray, gray, or grayish brown. Texture is sand, loamy sand, or marl, and may contain fragments of shell. In some pedons, limestone is below a depth of 51 inches.

Terra Ceia soils are associated with Canaveral, Pennsuco, Perrine, and Perrine Variant soils. Canaveral soils are of mineral origin and are better drained. Pennsuco soils are loamy and have limestone at a depth of more than 40 inches. Perrine soils are loamy and have limestone at a depth of less than 40 inches. Perrine Variant soils have a thick layer of loamy material over organic materials.

Tc—Terra Ceia muck, tidal. This is a nearly level, very poorly drained organic soil in tidal mangrove swamps near the coast. This soil has organic materials more than 51 inches thick and is subject to daily or periodic tidal flooding.

Included with this soil in mapping are small areas of Arents, Pennsuco, and Perrine Variant soils. Also included are small areas of soils similar to Terra Ceia that have slightly less than 51 inches of organic material and soils that have 6 to 20 inches of gravelly sand fill material on the surface.

All areas of this soil remain in natural vegetation consisting of American mangrove, white mangrove, and, in places, a few giant leatherfern. Some Australian pine is in fringe areas where thin layers of spoil materials cover the surface.

This soil is severely limited for all uses because of tidal flooding and excessive wetness. In addition, the organic material that makes up this soil has low load-bearing capacity, which severely limits the construction of a stable foundation. This soil is best used in its natural condition as habitat for many kinds of marine life. It is a major breeding and spawning area for shellfish and other marine life.

This soil is in capability subclass VIIIw.

Udorthents

Udorthents consist of heterogeneous geologic material that has been excavated from canals and deposited along the bank or that has been hauled in from other locations and spread over natural soil. Where this material occurs as spoil mounds along canals or as embankments in highway interchanges and overpasses, the soil is well drained to excessively drained, has slopes of 2 to 40 percent, and has no water table within 80 inches. In other areas where this material has been spread smoothly over the natural soil and shaped for the desired use, the soil is generally somewhat poorly drained to moderately well drained, has slopes that are nearly level, and has a water table that is generally at a depth of 20 to 50 inches.

Udorthents vary greatly in their properties. In one of the more common profiles, light gray to white unconsolidated material extends from the surface to a depth of 57 inches. This material is 65 percent limestone fragments and broken shell, 30 percent sand, and 5 percent loamy carbonatic material.

Permeability is generally rapid, and available water content is very low or low. Natural fertility and organic matter content are also low.

Unused spoil areas commonly are covered by Australian pine, Brazilian pepper trees, and an assortment of grasses, weeds, and shrubs. Some areas are used as a source of fill material. Most of these unused spoil areas are severely eroded. Areas of Udorthents that have been shaped and contoured are used for highways, golf courses, sanitary landfills, and other urban and recreational purposes.

Reference pedon of Udorthents, about 0.6 mile west of University Drive and 0.3 mile north of State Highway 84, SE1/4SE1/4SW1/4 sec. 16, T. 50 S., R. 41 E.:

C—0 to 57 inches; mixed light gray (10YR 7/1) and white (10YR 8/1) unconsolidated material; 65 percent broken shell rock and limerock fragments, 30 percent sand mixed with shell, and 5 percent loamy carbonatic material; few fine faint very dark mottles; massive; friable; moderately alkaline.

Reaction ranges from moderately alkaline to strongly alkaline. The material is mainly gray, white, dark gray, brown, yellow, dark yellowish brown, and pale brown. It is a mixture of shell rock and limerock fragments, sand, shell, loamy sand, and sandy loam or loamy carbonatic material.

Associated with Udorthents are Urban land and areas of manmade lakes and canals.

Ud—Udorthents. This soil consists of unconsolidated or heterogeneous geologic material removed in the excavation of ditches, canals, lakes, and ponds. It is

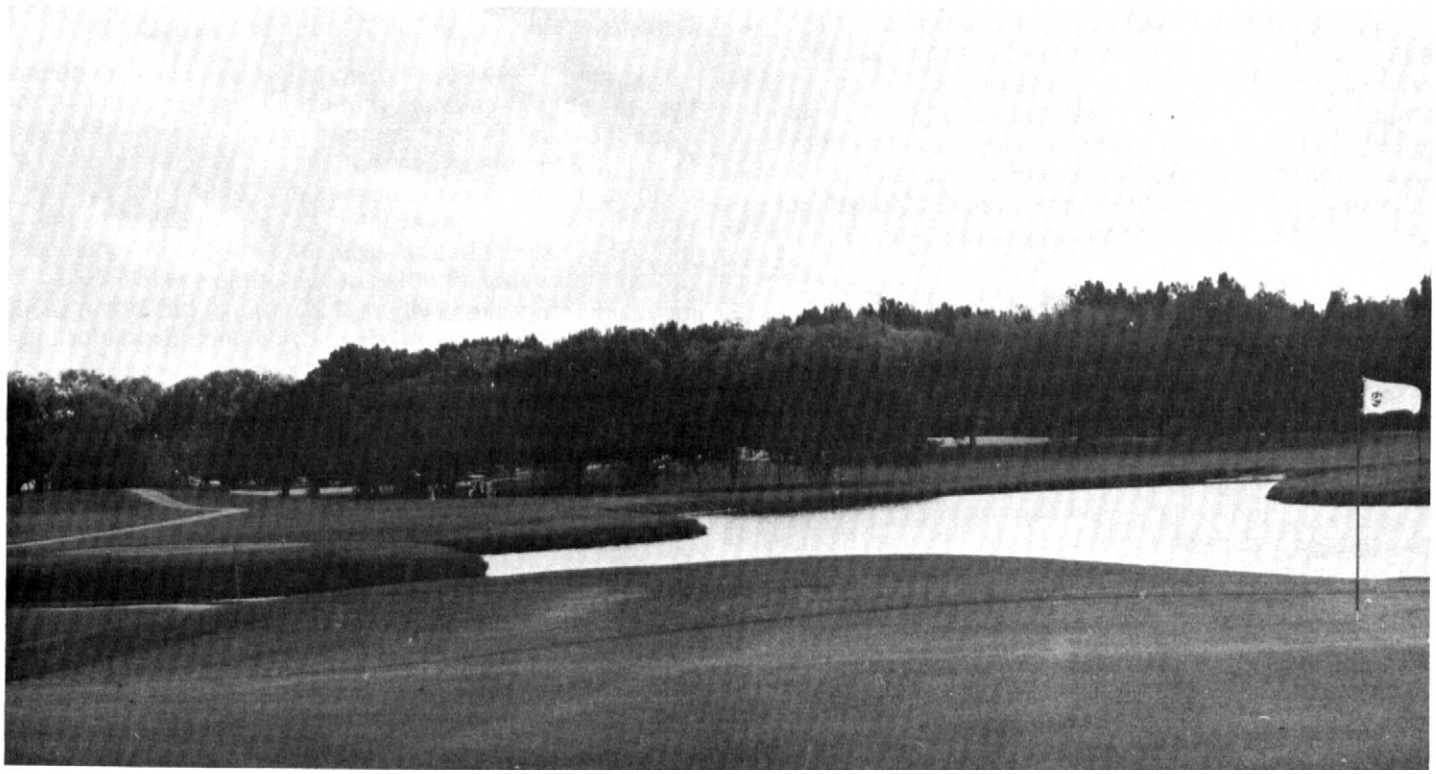

Figure 10.—Year-round golf on numerous courses is a major recreational attraction. The soils are Udorthents, shaped.

commonly piled along banks and has slopes of 2 to 40 percent. Few if any other soils are included in mapping. The soil is moderately well drained.

Weeds and native grasses have become established on some areas of Udorthents. Other areas have little or no vegetation. The soil material is erodible, especially where slopes are steep and where areas are bare or sparsely vegetated.

This soil is unsuited to cultivated crops, citrus, or improved pasture. It is frequently used as a source of roadbuilding material and as a source of fill for new homesites, golf courses, and other purposes.

This soil is not assigned to a capability subclass.

Um—Udorthents, marly substratum-Urban land complex. About 50 to 75 percent of this complex consists of Udorthents, marly substratum, which are in open land areas; and 25 to 45 percent consists of Urban land, or areas covered by concrete and buildings. The areas of these components are so intermixed or so small that to map them separately at the scale of mapping used is impractical. Slopes are 0 to 2 percent.

The open areas of Udorthents, marly substratum, are lawns, vacant lots, parks, playgrounds, and idle areas. Urban land consists of streets, sidewalks, parking lots, and buildings or other constructions where the soil is covered and cannot be readily observed.

This map unit occurs only in the southeastern part of the survey area. It is made up of a layer of mixed limestone fragments, sand, and shell about 20 to 50 inches thick over the natural soil, which is predominantly calcareous silt loam (marl). The overburden material is mostly in shades of gray, brown, and white and has occasional pockets or lenses of black. The natural marl soil below is similar to that described as representative for the Perrine or Pennsuco series.

The water table depends on the established drainage in the area, but in most areas it is at a depth of about 30 to 40 inches. Commonly, depth to the water table is the same as the depth to the natural soil in any particular area. In general, the rocky sand mixture of overburden material is rapidly permeable and the available water capacity is low. Natural fertility is also low.

Included with this complex in mapping are small areas in which the overburden material is dominantly sand and other small areas in which the fill material overlies 12 to 48 inches of muck.

To properly establish and maintain lawns and ornamentals on the soil in this complex, a layer of good topsoil about 6 inches thick is needed. In addition, proper watering and regular applications of fertilizer are needed.

The soil is well suited to many urban uses, but has moderate to severe limitations as a foundation for roads or buildings. The marl substratum, when wet, is compressible under mobile or static loads. The severity of the limitation depends upon the degree of drainage provided and the thickness of the overburden. Areas of this unit that are inadequately drained and have less than 3 feet of fill material are poorly suited to use as foundations for major roads, buildings, or large homes.

The determined use of this map unit for the foreseeable future is urban related.

This complex is not placed in a capability subclass.

Un—Udorthents, shaped. This map unit consists of a mixture of soil and geologic soil materials that has been shaped and contoured mainly for golf courses and major highways. This mixed material is commonly obtained from nearby excavations and spread over the natural soil to a depth of 20 inches or more. It consists primarily of

Figure 11.—An area of Urban land. More than 70 percent of the natural soil is covered by buildings and pavement.

limestone fragments and sand. Slope is commonly nearly level to gently sloping (0 to 5 percent) but ranges to steep (20 to 45 percent) on the short side slopes of highway interchanges. This soil is somewhat poorly drained to moderately well drained in most areas.

Where the mixed fill material is less than about 30 inches thick, most of the underlying natural soils can be identified. Of these, Hallandale and Margate soils are dominant and the others include Immokalee soils, Basinger soils, and other poorly drained and very poorly drained soils.

Included with Udorthents, shaped, in mapping are small areas of Urban land and Arents. Also included are small areas that have less than 20 inches of fill material and areas in which the fill material rests on layers of organic material ranging from thin to thick.

Depth to the water table depends somewhat on the established drainage in the area, but it is generally 20 to 50 inches most of each year. Permeability is variable but generally is rapid. The available water capacity is commonly low. Also, natural fertility and organic matter content are low. Under good management, which includes proper fertilization and irrigation, grasses and landscaping ornamentals can be grown satisfactorily.

The determined use of this soil for the foreseeable future is for recreation (fig. 10) and other urban purposes.

This soil is not assigned to a capability subclass.

Uo—Udorthents-Urban land complex. About 50 to 70 percent of this complex consists of Udorthents, which are in open areas; and about 30 to 50 percent consists of Urban land, or areas covered by concrete and buildings. The areas of these components are so intermixed or so small that to map them separately at the scale of mapping used is impractical.

The open areas of Udorthents are lawns, vacant lots, parks, and playgrounds. Urban land consists of streets, sidewalks, parking lots, and buildings or other construction where the soil is covered and cannot be readily observed.

Udorthents are nearly level, somewhat poorly drained or moderately well drained soils consisting of a mixture of sand, rock fragments, and shell more than 20 inches thick over natural soils. This mixed soil material has been placed over wet, sandy soils in low areas to make them suitable for building sites or other uses. The underlying natural soil can generally be identified in places where the fill material is less than about 30 inches thick.

Included with this complex in mapping are small areas of sandier Arents soils and scattered areas of Udorthents which are not presently being developed for urban uses. Also included are similar soils that have less than 20 inches of overburden material and scattered small areas in which the overburden material rests on organic soils.

Depth to the water table in the Udorthents depends on the established drainage in the area, but is commonly 20 to 50 inches most of each year. Permeability is variable but generally is rapid. The available water capacity is generally low. Also, natural fertility and organic matter content are low. Under good management, which includes proper watering and fertilization, commonly grown lawn grasses and ornamentals can be produced satisfactorily.

The determined use of this map unit for the foreseeable future is urban related.

This complex is not assigned to a capability subclass.

Urban land

Ur—Urban land. This map unit consists of areas that are more than 70 percent covered by airports, shopping centers, parking lots, large buildings, streets and sidewalks, and other structures, so that the natural soil is not readily observable (fig. 11).

Unoccupied areas of this land type, mostly lawns, parks, vacant lots, and playgrounds, consist of soils in the Hallandale, Margate, Immokalee, and Basinger series that have been altered by fill material spread on the surface to an average thickness of about 12 inches. These unoccupied areas are in tracts too small to be mapped separately. The fill is mostly sandy material, some of which contains limestone and shell fragments.

This map unit is not assigned to a capability subclass.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

John D. Lawrence, conservation agronomist, and Adam G. Hyde, assistant state soil scientist, Soil Conservation Service, assisted in preparing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the soils in Broward County, Eastern Part, are suited to farming only if water is controlled. The soils most commonly used for truck crops, citrus, and pasture are poorly drained and have a sandy surface layer and a sandy or loamy subsoil that extends to limestone.

In many fields, preparing a good seedbed and tilling are difficult because of shallowness to limestone. The soils that have organic surface layers are also used for pasture and some truck crops. These soils are very poorly drained, and most of them have limestone at a depth of less than 50 inches. If not completely saturated, the organic layers oxidize or subside at the rate of about 1 inch per year.

About 36,000 acres is used as pasture for beef or dairy cattle. Several dairies are in the area. On most of the land used for pasture, water-control measures are used and improved grasses, such as pangola, bahia, and St. Augustine, are grown. Approximately 7,000 acres is used for truck crops, mostly snap beans, sweet corn, eggplant, squash, and tomatoes. Citrus, mostly oranges, is grown on about 3,000 acres. About 1,300 acres is used for sod and nursery products.

Urban development is expanding rapidly in the survey area, and the acreage of land used for farming is decreasing. It is estimated that the decrease is about 5,000 acres per year. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General Soil Map Units."

Wind erosion is a major hazard on unprotected soils in the survey area, because most of the soils are sandy or mucky and are subject to soil blowing. Wind erosion can damage soils and tender crops in a few hours if the winds are strong and the soil is dry and bare of vegetation and surface mulch. Maintaining vegetative cover and surface mulch minimizes wind erosion.

Wind erosion is damaging for several reasons. It reduces soil fertility by removing fine soil particles and organic matter; it damages or destroys crops by sandblasting; it spreads diseases, insects, and weed seeds; and it creates health hazards and cleaning problems. Control of wind erosion minimizes duststorms and improves air quality.

Field windbreaks of suitable trees and shrubs such as Carolina laurelcherry, slash pine, southern redcedar, and Japanese privet, and strip crops of small grain are effective in reducing wind erosion and crop damage. Field windbreaks and strip crops are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The intervals depend on the erodibility of the soil and the susceptibility of the crop to damage from sandblasting.

Water erosion is a hazard in areas where slope is greater than 2 percent—about one-tenth of the cropland and pastureland in the survey area. Water erosion can damage soils if rains are intense and soils are bare of vegetation and surface mulch.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost, and organic matter content is reduced as part of the subsurface layer is incorporated into the plow layer. Second, the soil that erodes from farmland enters streams as sediment. Controlling erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on erodible sloping land, provide nitrogen, and improve tilth for the following crop.

Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area.

Information for the design of erosion control practices for each kind of soil is contained in the "Water and Wind Erosion Control Handbook—Florida," which is available in local offices of the Soil Conservation Service.

Drainage is a major management need on about 90 percent of the acreage used for crops and pasture in the survey area. Some soils are naturally so wet that the production of crops common to the area is generally not practical without extensive water control. Such soils are the poorly drained Basinger, Boca, Hallandale, Immokalee, Margate, and Pompano soils and the very poorly drained Dania, Lauderhill, and Sanibel soils.

Unless artificially drained, the moderately well drained soils are wet enough in the rooting zone during the wet seasons to cause damage to some crops in most years. Included in this category are Pomello soils.

Artificial drainage is also needed on the poorly drained soils to prevent damage to pasture plants during the wet seasons. These are mainly the Basinger, Hallandale, Immokalee, Margate, and Pompano soils. These soils also have a low water-holding capacity and are droughty during dry periods. Subsurface irrigation of these soils is needed for maximum pasture production.

The very poorly drained soils are very wet during rainy periods and in most areas have water standing on the surface. On these soils, artificial drainage is needed to produce pastures of high quality. Some of these very poorly drained soils are the Lauderhill, Okeelanta, Plantation, and Sanibel soils.

The design of both surface drainage and subsurface irrigation systems varies according to the kind of soil and the pastures grown. A combination of surface drainage and subsurface irrigation systems is needed on these soils for intensive pasture production. Information on drainage and irrigation for each kind of soil is contained in the "Technical Guide" available in the local offices of the Soil Conservation Service.

Soil fertility is naturally low on most soils in the survey area. Most of the soils have sandy surfaces and are light colored. The Boca, Dade, and Hallandale soils range from acid to neutral in the surface layer and are underlain by neutral to moderately alkaline limestone. A few of the soils, for example the Perrine soils, have a loamy subsoil. The Canaveral, Paola, and St. Lucie soils have sandy material to a depth of 80 inches or more. The Duette, Immokalee, and Pomello soils have an organically stained subsoil layer. In most of the soils, reaction in the surface layer ranges from strongly acid to very strongly acid. If the soils have never been limed, ground limestone is needed to raise the pH levels sufficiently for good growth of crops. Nitrogen and potash and available phosphorus levels are naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crops, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils in the survey area have a sandy surface layer that is light in color and low to moderate in organic matter content. The exceptions are the Dania, Lauderhill, Okeelanta, Perrine, Plantation, and Sanibel soils.

Most soils in the survey area have weak structure in the surface layer. In dry soils that have low organic matter content, intense rainfall causes the colloidal matter to cement, forming a slight crust. The crust is slightly hard and slightly impervious to water when dry, thus it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help to improve soil structure and reduce crust formation.

Special crops grown include citrus, tomatoes, sweet corn, snap beans, cucumbers, pepper, squash, eggplant, cauliflower, nursery plants, and sod. If economic conditions are favorable, the production of blueberries, grapes, blackberries, nursery plants, sod, cabbage, cauliflower, turnips, and mustard could be increased.

Deep soils that have good natural drainage are especially well suited to citrus. In the survey area these are the Paola and St. Lucie soils, and they total about 1,500 acres. With water control the Basinger, Boca, Hallandale, Margate, Okeelanta, Pennsuco, Plantation, and Pompano soils are suited to vegetables and small fruit.

Most of the well drained and moderately well drained soils in the survey area are suited to orchards and nursery plants. Soils in areas where air drainage is poor and frost pockets frequently occur are generally poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pastures in the survey area produce forage for beef and dairy cattle. Beef cattle cow-calf operations are the major cattle systems. Bahiagrass, pangolagrass, limpograss (*Hermathria latissina*), and bermudagrass are the most commonly grown pasture plants in the survey area. Grass seeds or vegetative material could be harvested from these grasses for improved pasture plantings as well as for commercial purposes. Many cattlemen overseed ryegrass on pastures in the fall for winter and spring grazing. In summer, excess grass is harvested from pangolagrass and bermudagrass for use as hay during the winter months.

The moderately well drained soils such as Duette and Pomello soils are moderately suited to bahiagrass and improved bermudagrass. Under good management, hairy indigo and alyceclover can be grown during the summer and fall.

If properly drained, the Basinger, Boca, Hallandale, Immokalee, Margate, and Pompano soils are well suited to bahiagrass and limpograss pasture. Using subsurface irrigation in areas of these soils where it is needed increases the length of growing season and the total forage production. If adequately limed and fertilized, these soils are well suited to legumes such as white clover.

Pasture in many parts of the county has been greatly depleted by continuous excessive grazing. Yields of pasture can be increased by liming, fertilization, planting legumes, irrigation, and other management practices.

Differences in the amount and kind of pasture yields are related closely to the kind of soil. Management of pasture is based on the relationship between soils, pasture plants, lime, fertilizer, moisture, and grazing practices.

Latest information and suggestions for growing pastures can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Predicted yields of hay and pasture for varieties of grasses and legumes commonly grown are shown in table 6. The yields are in animal-unit-months (AUM). An animal-unit-month is the amount of forage needed for one cow and her calf for 30 days.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

John F. Vance, Jr., biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, browntop millet, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bahiagrass, Florida beggarweed, clover, and sesbania.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, partridge pea, and bristlegrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, red maple, sweetgum, wild grape, palmetto, and greenbriar. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are firethorn, wild plum, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cypress, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, and cottontail.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, herons, shore birds, otters, and alligators.

Most of the survey area is urbanized or closely associated with urban development. As a result, the only potential for wildlife in the future is for species that are suited to south Florida residential areas. These are mostly bird species, such as house sparrows, grackles, sea gulls, mockingbirds, cardinals, and mourning doves. Egrets and herons are found along drainage canals and golf course ponds. Gray squirrels and a few raccoons are in the few wooded areas that remain.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Controlling Erosion on Building Sites

Disturbing soil by landscaping or construction operations removes vegetation and leaves the soil vulnerable to erosion. Wind and water erosion can be reduced by clearing and disturbing only the minimum area needed for construction. In areas to be landscaped, constructing diversions and contouring help reduce the length of slopes and thus reduce runoff and soil blowing. These methods are most practical on soils that have uniform slopes.

Grading removes topsoil and, in the Boca, Pennsuco, and Perrine soils, may expose the loamy subsoil. Ripping these exposed subsoils and covering them with less erodible topsoil helps to reduce erosion.

On sandy soils, soil blowing is a major hazard. Blowing soil can affect drainage ditches, roads, fences, and equipment. The air pollution caused by blowing soil can create health problems.

Wind erosion can be minimized by maintaining vegetative cover and surface mulch and by planting windbreaks of shrubs and trees and strip crops of small grains. Mulching helps to reduce damage from water runoff and soil blowing and improves moisture conditions for seedlings.

Information on the design of erosion control practices for each kind of soil is available in local offices of the Soil Conservation Service.

Sanitary Facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter in the soil is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing and seepage.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plant growth. Therefore, material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for embankments, dikes, and levees and for aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105° C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

In table 15, some soils are assigned to two hydrologic soil groups. Soils that have a seasonal high water table but can be drained are assigned first to a hydrologic group that denotes the drained condition and then to a hydrologic group that denotes the undrained condition; for example, B/D. Because there are different degrees of drainage and water table control, onsite investigation is needed to determine the hydrologic group of the soil in a particular location.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall is not considered flooding, nor is water in swamps and marshes.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 15 shows the expected initial subsidence, which usually is a result of drainage.

Physical and Chemical Analyses of Selected Soils

Dr. F. Calhoun, Jr., Dr. R. E. Caldwell, and Dr. V. W. Carlisle, Soil Science Department, University of Florida, prepared this section.

Particle-size distribution of eleven soil series is shown in table 16, chemical properties of twelve soil series are shown in table 17, and physical properties of eleven soil series are shown in table 18. These analyses were conducted and coordinated by the Soil Characterization Laboratory, Soil Science Department, University of Florida. Detailed descriptions of the soils, including their location, are given in the section "Soil Descriptions."

In addition to the data presented in tables 16, 17, and 18, the results of laboratory analyses for other soils identified in the survey area (profiles sampled in other counties) are on file in the Soil Science Department, University of Florida. Data of this nature are useful in classification, determination of potential productivity, and understanding the genesis of soils.

Laboratory Methods

Most of the data were obtained using methods outlined in Soil Survey Investigations Report No. 1 (*6*). Where such methods are mentioned in this section, the symbols identifying the specific procedures in the report are given.

Soil samples collected from carefully selected sites were air-dried, rolled or crushed, and sieved through a 2-

millimeter screen. *Particle-size distribution* data were obtained by the hydrometer method after dispersion and shaking with sodium hexametaphosphate (*3*). The sand fractions were obtained by dry-sieving through a nest of sieves for at least 15 minutes and expressed on an oven-dry weight basis. The percentage of silt was determined by difference.

Measurements of *soil reaction* (pH) were made by procedure 8C1 of Soil Survey Investigations Report No. 1 using a glass electrode. *Extractable bases* were obtained by leaching a soil sample with ammonium acetate buffered at pH 7.0 as outlined in procedure 5B1. These cations were then determined separately using a Beckman DU flame spectrophotometer. *Titratable acidity*, which is roughly equivalent to the exchangeable acidity of procedure 6H2a (*6*), was determined by potentiometric titrations with 0.05*N* barium hydroxide using a Sargent Model D Recording Titrator after immersing 10 grams of soil in 50 milliliters of neutral 1*N* KCl (*10*). *Cation exchange capacity* was calculated by summing the exchangeable bases and titratable acidity. *Base saturation* was derived by dividing the sum of exchangeable bases by the cation exchange capacity and then multiplying by 100.

Organic matter was determined by a modification of the Walkley-Black wet combustion method as outlined in procedure 6A1a. *Total nitrogen* was obtained by the semi-micro Kjeldahl method as shown in procedure 6B2a.

Resistivity (ohms/cm) or an "R" value was obtained using a Model 100 Corrosion Tester. The *corrosion potential* or a "C" value that was obtained from the manufacturer's tables is directly related to the "R" value. The smaller the "C" value, the less the corrosion and the greater the expectancy of pipe life. Generally, C values range from 1 to 10, and pipe life ranges accordingly from 20 to 2 years.

Bulk density, *saturated hydraulic conductivity*, and *water retention* at 0.10 and 0.33 bar were measured on 3.0 by 5.4 centimeter cylindrical (undisturbed) soil cores. Water retention at 15-bar suction was determined on disturbed or loose soil samples by procedure 4B2.

Water retention difference was calculated using procedures 4C1 and 4C2. For sandy soils, 1/10 bar was used; and for organic soils, 1/3 bar. Water retention difference is considered by many to closely approximate available water capacity.

Engineering Index Test Data

Table 19 presents engineering test data for some of the major soil series in the survey area. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Moisture-density (or compaction) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *maximum dry density* is reached. After that, density decreases with increase in moisture content. The moisture content at the point of maximum dry density is termed the *optimum moisture content*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Formation of the Soils

This section describes the factors affecting soil formation and morphology of the soils of the survey area. It also describes the processes of soil formation.

Factors of Soil Formation

Soil is formed by weathering and other processes that act on the parent material. The characteristics of the soil, at any given point, are determined by parent material, climate, plants and animals, relief, and time.

Climate and plants and animals are the active forces of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into soil. All five factors come into play in the formation of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of a soil and fix most of it properties. In general, however, it is the combined action of the five factors that determines the present character of each soil.

Parent Material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soil. All of the soils in the survey area formed in material of Pleistocene or Recent ages. Slightly over 75 percent of the area is covered by the Pamlico Terrace, and the rest by organic material of Recent age (*4*).

The Pamlico Terrace consists mostly of sand and ranges from less than 1 foot to about 8 feet or more in thickness. Near the Executive Airport, the Pamlico Terrace is made up of thick deposits of sand that give rise to the Paola soils.

The survey area is generally underlain by the Miami Oolite Formation, a porous limestone formed from small spherules of carbonate of lime. To the north, the oolite merges laterally into the Anastasia Formation (a coquinoid limestone, sand, and clay) near the Hillsboro Canal. The northern part of the Everglades in the survey area is underlain by the Fort Thompson Formation (a shell hash of alternating marine- and fresh-water mollusks, clay, and sand) that grades into the Miami Oolite in the southern part.

Near the conservation area the Pamlico Terrace is thin over the Miami Oolite limestone. Common in this area are Hallandale soils that are sandy and shallow and extend into the porous limestone in solution holes. In other places, such as the area around Andytown, there is a thin layer of organic material over limestone that gives rise to the Dania soils.

Climate

The survey area has a tropical climate near the coast and a subtropical climate west of the coastal area. The relatively high year-round temperature and large amount of rainfall have hastened soil development. Because the abundant rainfall continuously leaches and translocates soluble minerals, the soils contain only small amounts of organic matter and soluble plant nutrients. Only the soils that were once covered with organic material have fairly high amounts of organic material in the surface layer. Although the climate changes from tropical to humid subtropical, this has caused few differences among the soils.

Plants and Animals

Plants have been the principal biological factor in the formation of soils in the area, but animals, insects, bacteria, and fungi also have been important. Two of the chief functions of plant and animal life are to furnish organic matter and to bring plant nutrients from the lower to the upper horizons. Differences in the amount of organic matter, nitrogen, and plant nutrients in the soils and differences in soil structure and porosity are among those caused by plants and animals.

Relief

Relief has affected the formation of soils in the area, primarily through its influence on soil-water relationships. Other factors of soil formation normally associated with relief, such as erosion, temperature, and plant cover, are of minor importance.

The survey area is a nearly level plain with an elevation of 2 to 10 feet except for several ridges which are slightly higher. It comprises three general types of areas—flatwoods; wet, grassy flats or Everglades; and coastal ridges. Differences in the soils of these general areas are directly related to differences in relief.

The soils in the flatwoods area have a higher water table and are periodically wet to the surface. These soils, therefore, are not so highly leached as some on the coastal ridges. The soils in the Everglades or wet, grassy flats are covered with water for long periods and have a high content of organic matter on the surface. The soils on the coastal ridges are at higher elevations than those of the flatwoods or Everglades areas, are mostly excessively drained or well drained, and are not influenced by a ground-water table.

Time

Time is an important factor in the formation of soils. Normally, a long time is required for formation of soils that have distinct horizons. The difference in length of time that parent materials have been in place commonly is reflected in the degree of development of the soil.

Some basic minerals from which soils are formed weather fairly rapidly, but other minerals change slowly even though weathering has taken place over a long period. The translocation of fine particles within soils to form the various horizons varies under different conditions. All of the soil forming processes, however, require a relatively long period. Almost pure quartz sand that is highly resistant to weathering is the dominant geologic material in the survey area. Only one soil in the area contains enough fine-textured material to be classified in a loamy family rather than a sandy or coarse-silty family. The organic soils of the Everglades were formed by decayed organic material that built up over the years in shallow water.

In terms of geologic time, the soil material that makes up most of the soils of the area is young. Not enough time has elapsed since the material was laid down or emerged from the sea for pronounced genetic horizons to develop. Some thin, loamy horizons have formed in place through the process of weathering. An example is the Boca soils. A distinct genetic horizon, such as the spodic horizon, has formed in the Immokalee and Pomello soils; however, the time required for its development is relatively short.

Processes of Soil Formation

The main processes involved in the formation of soil horizons are accumulation of organic matter, leaching of calcium carbonate and bases, reduction and transfer of iron, and formation and translocation of silicate clay minerals. These processes can occur in combination or singly, depending on the integration of the factors of soil formation.

Some organic matter has accumulated in the upper layers of most of the soils to form an A1 horizon. The quantity of organic matter is small in some of the soils but fairly large in others. Leaching of carbonates and salts has occurred in nearly all of the soils. The effects of leaching have been indirect, in that the leaching permitted the subsequent translocation of silicate clay materials in some soils. Most of the soils of the county are leached to varying degrees.

The reduction and transfer of iron has occurred in most of the soils of the survey area but not in the organic soils. In some of the wet soils, iron has been segregated within the deeper horizons to form reddish brown mottles and concretions.

In the Boca soil, evidence of weathering and clay movement, or alteration, is present in the form of a light colored, leached A2 horizon and a loamy Bt horizon that has sand grains coated and bridged with clay material.

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Glossary

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Medium	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A or A1 horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Marl. An unconsolidated mineral material deposited in marine or fresh water. It consists chiefly of silt- and clay-size particles of calcium carbonate.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Water table. The upper limit of the soil that is wholly saturated with water.

Apparent water table. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Perched water table. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated by a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wetness (in tables). Soil is wet during the period of use.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1962-71 at Fort Lauderdale Experiment Station]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: 2 years in 10 will have at least 4 days with-- Maximum temperature equal to or higher than--	Temperature: 2 years in 10 will have at least 4 days with-- Minimum temperature equal to or lower than--	Precipitation: Average monthly total	Precipitation: 1 year in 10 will have-- Less than--	Precipitation: 1 year in 10 will have-- More than--	Precipitation: Average number of days with rainfall of-- 0.10 inch or more	Precipitation: Average number of days with rainfall of-- 0.50 inch or more	Precipitation: Pan evaporation
	°F	°F	°F	°F	In	In	In			In
January---	75.4	55.0	84	37	2.11	0.66	3.67	5	2	3.71
February--	75.7	54.6	85	43	3.14	0.10	5.78	4	2	4.11
March-----	78.8	58.7	88	44	2.56	0.19	11.67	3	2	5.81
April-----	83.4	63.4	91	53	1.68	0.03	5.58	2	1	7.08
May-------	85.9	67.2	91	57	6.73	0.11	15.22	7	3	7.81
June------	88.0	70.9	92	66	11.11	5.05	21.18	12	7	6.58
July------	90.5	72.9	95	68	6.01	3.20	9.11	11	4	7.36
August----	90.8	72.9	94	69	7.04	4.41	9.01	10	5	7.07
September-	88.9	72.4	92	69	7.06	3.03	10.68	12	5	5.87
October---	85.4	68.3	90	60	9.16	2.96	14.29	10	4	5.42
November--	79.5	60.3	84	45	2.10	0.28	3.37	4	1	4.27
December--	76.6	55.6	84	40	1.39	0.11	4.30	2	1	3.78

TABLE 2.--COMPARISON OF WEATHER RECORDS IN BROWARD COUNTY

Station	Average annual temperature	Average number of days each year with temperature of 90° F or more	Average number of days each year with temperature of 32° F or less	Average annual precipitation	Average number of days each year with rainfall of--	
					0.10 inch or more	0.50 inch or more
				In		
Experiment Station------	73.8	82	1	60.1	82	37
Dixie Water Plant-------	75.4	71	(*)	60.3	83	39
Bahia Mar---------------	75.5	39	(*)	61.5	85	39
North New River Canal No. 2----------------	------------	-----------------	-----------------	53.9	----------	----------

* Trace. Less than 0.5 day.

TABLE 3.--RECORD OF LOW TEMPERATURES AT DAVIE IN BROWARD COUNTY

[Period of record 1937-67]

Temperature	Percent of seasons at or below various temperatures before--							Percent of seasons at or below various temperatures after--						
	November 20	December 10	December 30	January 19	February 18	March 10	March 30	November 20	December 10	December 30	January 19	February 18	March 10	March 30
°F														
36	0	23	57	87	100	100	100	100	100	100	83	50	13	0
32	0	13	33	57	77	83	83	83	80	73	50	17	3	0
28	0	0	7	17	33	33	33	37	37	30	20	3	0	0
26	0	0	7	7	17	17	17	17	17	10	17	0	0	0
24	0	0	0	0	3	3	3	3	3	3	3	0	0	0

TABLE 4.--RATINGS AND LIMITATIONS OF ASSOCIATIONS ON THE GENERAL SOIL MAP

[Ratings are based on the dominant soil]

Soil association	Percent of survey area	Degree* and kind of limitations for--		Suitability** for--		
		Urban uses	Recreation areas	Citrus	Vegetables	Improved pasture
1.Paola-Urban land-St. Lucie	2.7	Slight---------	Severe: too sandy.	(***)	(***)	(***)
2.Palm Beach-Urban land-Beaches	1.4	Slight---------	Severe: too sandy.	(***)	(***)	(***)
3.Dade-Urban land	5.3	Slight---------	Severe: too sandy.	(***)	(***)	(***)
4.Duette-Urban land-Pomello	3.2	Slight---------	Severe: too sandy.	(***)	(***)	(***)
5.Immokalee-Urban land-Pompano	14.0	Severe: wetness.	Severe: wetness, too sandy.	(***)	(***)	(***)
6.Immokalee-Urban land	3.5	Severe: wetness.	Severe: wetness, too sandy.	(***)	(***)	(***)
7.Hallandale-Margate	39.2	Severe: depth to rock, wetness.	Severe: wetness, too sandy, depth to rock.	Poorly suited: wetness.	Poorly suited: wetness.	Well suited.
8.Lauderhill-Dania	24.4	Severe: wetness, low strength.	Severe: wetness, excess humus.	(***)	Well suited.	Well suited.
9.Udorthents-Urban land-Pennsuco	3.0	Severe: unstable fill.	Severe: too sandy, stones.	(***)	(***)	(***)
10.Arents-Urban land	3.3	Moderate: wetness.	Severe: too sandy.	(***)	(***)	(***)

*A rating of slight means that the soil properties and site features are generally favorable for the intended use and limitations are minor and easily overcome; moderate means that the soil properties or site features are not favorable for the intended use and that special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe means that the soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction cost, and, possibly, additional maintenance are required.

**A rating of well suited means that normal practices are sufficient for good production. A rating of moderately suited indicates that normal practices are sufficient for fair or good production. The practices are somewhat harder to install or maintain on a moderately suited soil, or the soil is less productive. Poorly suited means that major modification of the site is needed before crops are planted and that a high degree of maintenance is generally required.

***The soil is not normally in this use, or it is in urban use.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ae	Arents-Urban land complex	6,425	2.4
Ao	Arents, organic substratum-Urban land complex	5,125	1.9
Ba	Basinger fine sand	3,010	1.1
Bc	Boca fine sand	1,705	0.6
Be	Beaches	525	0.2
Ca	Canaveral-Urban land complex	260	0.1
Da	Dania muck	15,100	5.7
Dd	Dade fine sand	960	0.4
Df	Duette-Urban land complex	6,165	2.3
Du	Dade-Urban land complex	8,575	3.2
Ha	Hallandale fine sand	34,690	13.0
Hb	Hallandale-Urban land complex	8,640	3.3
Hm	Hallandale and Margate soils	4,820	1.8
Ia	Immokalee fine sand	9,195	3.5
Ir	Immokalee, limestone substratum-Urban land complex	15,330	5.8
Iu	Immokalee-Urban land complex	14,375	5.4
La	Lauderhill muck	34,060	12.8
Ma	Margate fine sand	29,055	11.0
Mu	Margate-Urban land complex	8,640	3.3
Ok	Okeelanta muck	725	0.3
Pa	Paola fine sand	733	0.3
Pb	Paola-Urban land complex	2,675	1.0
Pc	Palm Beach sand	285	0.1
Pe	Pennsuco silty clay loam	740	0.3
Pf	Pennsuco silty clay loam, tidal	1,215	0.5
Pm	Plantation muck	7,125	2.7
Po	Pomello fine sand	1,255	0.5
Pp	Pompano fine sand	2,935	1.1
Ps	Perrine silty clay loam	265	0.1
Pu	Palm Beach-Urban land complex	615	0.2
Pv	Perrine Variant silt loam	120	*
Sa	Sanibel muck	2,845	1.1
St	St. Lucie fine sand	805	0.3
Tc	Terra Ceia muck, tidal	285	0.1
Ud	Udorthents	2,455	0.9
Um	Udorthents, marly substratum-Urban land complex	550	0.2
Un	Udorthents, shaped	7,905	3.0
Uo	Udorthents-Urban land complex	2,050	0.8
Ur	Urban land	13,290	5.0
	Water	9,745	3.7
	Total	265,273	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Tomatoes	Sweet corn	Cabbage	Oranges	Grapefruit	Grass	Grass-clover
	Ton	Ton	Crate	Box	Box	AUM*	AUM*
Ba------------------------ Basinger	13	---	400	300	400	8.0	12.0
Bc------------------------ Boca	13	3.7	---	225	275	8.0	---
Da------------------------ Dania	---	---	---	---	---	10.0	12.0
Dd------------------------ Dade	15	---	---	300	400	3.5	---
Ha------------------------ Hallandale	10	---	300	225	275	7.5	---
Hm------------------------ Hallandale and Margate	11	---	265	225	275	6.0	---
Ia------------------------ Immokalee	13	---	200	300	425	8.0	12.0
La------------------------ Lauderhill	---	4.5	340	---	---	12.0	15.0
Ma------------------------ Margate	11	---	220	225	275	6.5	12.0
Ok------------------------ Okeelanta	---	4.5	350	---	---	12.0	15.0
Pa------------------------ Paola	10	---	---	450	550	4.0	---
Pe------------------------ Pennsuco	8	---	---	---	---	---	---
Pm------------------------ Plantation	---	3.5	280	---	---	12.0	15.0
Po------------------------ Pomello	---	---	---	350	450	4.0	---
Pp------------------------ Pompano	11	4	260	300	400	8.0	12.0
Ps------------------------ Perrine	8	---	---	---	---	---	---
Pv------------------------ Perrine Variant	8	---	---	---	---	---	---
Sa------------------------ Sanibel	---	3.5	450	---	---	12.0	15.0
St------------------------ St. Lucie	---	---	---	---	---	4.0	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow and her calf) for 30 days.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definition of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ae*:					
Arents	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Urban land.					
Ao*:					
Arents	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: wetness.
Urban land.					
Ba Basinger	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness.
Bc Boca	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Be*. Beaches					
Ca*:					
Canaveral	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Severe: droughty.
Urban land.					
Da Dania	Severe: ponding, excess humus, depth to rock.	Severe: ponding, excess humus, depth to rock.	Severe: excess humus, ponding, depth to rock.	Severe: ponding, excess humus.	Severe: ponding, thin layer, excess humus.
Dd Dade	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Df*:					
Duette	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Urban land.					
Du*:					
Dade	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Urban land.					
Ha Hallandale	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Hb*:					
Hallandale	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Urban land.					

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Hm*:					
Hallandale	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Margate	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding, droughty.
Ia: Immokalee	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Ir*:					
Immokalee	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Urban land.					
Iu*:					
Immokalee	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Urban land.					
La: Lauderhill	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Ma: Margate	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding, droughty.
Mu*:					
Margate	Severe: ponding, too sandy.	Severe: ponding, too sandy.	Severe: too sandy, ponding.	Severe: ponding, too sandy.	Severe: ponding, droughty.
Urban land.					
Ok: Okeelanta	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Pa: Paola	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Pb*:					
Paola	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Urban land.					
Pc: Palm Beach	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Pe: Pennsuco	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pf: Pennsuco	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pm------------------- Plantation	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Po------------------- Pomello	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Pp------------------- Pompano	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: wetness, too sandy.	Severe: wetness, droughty.
Ps------------------- Perrine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pu*:					
Palm Beach-----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Urban land.					
Pv------------------- Perrine Variant	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.
Sa------------------- Sanibel	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
St------------------- St. Lucie	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Tc------------------- Terra Ceia	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus, flooding.	Severe: wetness, flooding, excess humus.
Ud*------------------ Udorthents	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: large stones, slope.	Severe: too sandy.	Severe: droughty, slope.
Um*:					
Udorthents-----------	Severe: too sandy.	Severe: too sandy.	Severe: large stones, small stones, too sandy.	Severe: too sandy.	Severe: large stones, droughty.
Urban land.					
Un*------------------ Udorthents	Severe: too sandy, small stones.	Severe: too sandy, small stones.	Severe: too sandy, small stones, large stones.	Severe: too sandy.	Severe: small stones, large stones, droughty.
Uo*:					
Udorthents-----------	Severe: too sandy, small stones.	Severe: too sandy, small stones.	Severe: too sandy, small stones, large stones.	Severe: too sandy.	Severe: small stones, large stones, droughty.
Urban land.					
Ur*. Urban land					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for: Openland wildlife	Woodland wildlife	Wetland wildlife
Ae*, Ao*:										
Arents.										
Urban land.										
Ba-----Basinger	Poor	Poor	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair
Bc-----Boca	Poor	Fair	Fair	Poor	Poor	Good	Fair	Fair	Poor	Fair
Be*. Beaches										
Ca*:										
Canaveral	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
Da-----Dania	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good
Dd-----Dade	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Df*:										
Duette	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
Du*:										
Dade	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
Ha-----Hallandale	Poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair
Hb*:										
Hallandale	Poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair
Urban land.										
Hm*:										
Hallandale	Poor	Poor	Poor	Poor	Poor	Fair	Good	Poor	Poor	Fair
Margate	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Ia-----Immokalee	Poor	Poor	Fair	Poor	Poor	Fair	Poor	Poor	Poor	Poor
Ir*, Iu*:										
Immokalee	Poor	Poor	Fair	Poor	Poor	Fair	Poor	Poor	Poor	Poor
Urban land.										
La-----Lauderhill	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for: Openland wildlife	Woodland wildlife	Wetland wildlife
Ma: Margate	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Mu*: Margate	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good
Urban land.										
Ok: Okeelanta	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	---	Good
Pa: Paola	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Pb*: Paola	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Urban land.										
Pc: Palm Beach	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Pe: Pennsuco	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Good	Poor	Very poor.	Fair
Pf: Pennsuco	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair
Pm: Plantation	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good
Po: Pomello	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Pp: Pompano	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor	Poor	Fair
Ps: Perrine	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Good	Poor	Very poor.	Poor
Pu*: Palm Beach	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Urban land.										
Pv: Perrine Variant	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Good	Very poor.	Very poor.	Fair
Sa: Sanibel	Very poor.	Poor	Poor	Very poor.	Very poor.	Good	Good	Poor	Very poor.	Good
St: St. Lucie	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Tc: Terra Ceia	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Fair
Ud*. Udorthents										
Um*: Udorthents.										
Urban land.										

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Un*. Udorthents										
Uo*: Udorthents.										
Urban land.										
Ur*. Urban land										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ae*:						
Arents	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
Urban land.						
Ao*:						
Arents	Severe: cutbanks cave, excess humus.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Moderate: wetness.
Urban land.						
Ba Basinger	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Bc Boca	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Be*. Beaches						
Ca*:						
Canaveral	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
Urban land.						
Da Dania	Severe: depth to rock, ponding.	Severe: ponding, low strength, depth to rock.	Severe: ponding, depth to rock.	Severe: ponding, low strength, depth to rock.	Severe: depth to rock, ponding.	Severe: ponding, thin layer, excess humus.
Dd Dade	Severe: cutbanks cave.	Slight	Moderate: wetness, depth to rock.	Slight	Slight	Severe: droughty.
Df*:						
Duette	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
Urban land.						
Du*:						
Dade	Severe: cutbanks cave.	Slight	Moderate: wetness, depth to rock.	Slight	Slight	Severe: droughty.
Urban land.						
Ha Hallandale	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Hb*:						
Hallandale	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Urban land.						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Hm*:						
Hallandale	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness, depth to rock.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Margate	Severe: depth to rock, cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, droughty.
Ia: Immokalee	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Ir*, Iu*:						
Immokalee	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Urban land.						
La: Lauderhill	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.
Ma: Margate	Severe: depth to rock, cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, droughty.
Mu*:						
Margate	Severe: depth to rock, cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, droughty.
Urban land.						
Ok: Okeelanta	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.
Pa: Paola	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Pb*:						
Paola	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
Urban land.						
Pc: Palm Beach	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
Pe: Pennsuco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pf: Pennsuco	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.
Pm: Plantation	Severe: cutbanks cave, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Po----------------- Pomello	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
Pp----------------- Pompano	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty.
Ps----------------- Perrine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pu*:						
Palm Beach--------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight----------	Severe: droughty.
Urban land.						
Pv----------------- Perrine Variant	Severe: excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness, low strength.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Sa----------------- Sanibel	Severe: cutbanks cave, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, excess humus.
St----------------- St. Lucie	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Severe: droughty.
Tc----------------- Terra Ceia	Severe: excess humus, wetness.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding, excess humus.
Ud*---------------- Udorthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Um*:						
Udorthents--------	Severe: wetness, cutbanks cave.	Severe: unstable fill.	Severe: wetness, unstable fill.	Severe: unstable fill.	Severe: unstable fill.	Severe: large stones, droughty.
Urban land.						
Un*---------------- Udorthents	Severe: cutbanks cave, slope.	Moderate: wetness, large stones.	Severe: wetness.	Moderate: wetness, large stones.	Moderate: wetness, large stones.	Severe: small stones, large stones, droughty.
Uo*:						
Udorthents--------	Severe: cutbanks cave.	Moderate: wetness large stones.	Severe: wetness.	Moderate: wetness large stones.	Moderate: wetness large stones.	Severe: small stones, large stones, droughty.
Urban land.						
Ur*. Urban land						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ae*:					
Arents	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Urban land.					
Ao*:					
Arents	Severe: wetness, poor filter.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness, excess humus.	Poor: hard to pack.
Urban land.					
Ba Basinger	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Bc Boca	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, wetness, too sandy.	Severe: area reclaim, seepage, too sandy.	Poor: seepage, too sandy, wetness.
Be*. Beaches					
Ca*:					
Canaveral	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
Da Dania	Severe: depth to rock, ponding.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, ponding, excess humus.
Dd Dade	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage.	Poor: area reclaim, seepage, too sandy.
Df*:					
Duette	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
Du*:					
Dade	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage.	Poor: area reclaim, seepage, too sandy.
Urban land.					

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ha------------------ Hallandale	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
Hb*:					
Hallandale---------	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
Urban land.					
Hm*:					
Hallandale---------	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, seepage, too sandy.
Margate------------	Severe: depth to rock, ponding, poor filter.	Severe: seepage, depth to rock, ponding.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, seepage, too sandy.
Ia------------------ Immokalee	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ir*:					
Immokalee----------	Severe: wetness.	Severe: seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
Iu*:					
Immokalee----------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
La------------------ Lauderhill	Severe: depth to rock, ponding, poor filter.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, ponding, excess humus.
Ma------------------ Margate	Severe: depth to rock, ponding, poor filter.	Severe: seepage, depth to rock, ponding.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, seepage, too sandy.
Mu*:					
Margate------------	Severe: depth to rock, ponding, poor filter.	Severe: seepage, depth to rock, ponding.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, seepage, too sandy.
Urban land.					
Ok------------------ Okeelanta	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pa------------------- Paola	Slight**----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Pb*:					
Paola---------------	Slight**----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
Pc------------------- Palm Beach	Slight**----------	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Pe------------------- Pennsuco	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
Pf------------------- Pennsuco	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, depth to rock, seepage.	Severe: flooding, wetness, seepage.	Poor: wetness, thin layer.
Pm------------------- Plantation	Severe: depth to rock, ponding, poor filter.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: area reclaim, seepage, too sandy.
Po------------------- Pomello	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Pp------------------- Pompano	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ps------------------- Perrine	Severe: depth to rock, wetness.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Poor: area reclaim, wetness, thin layer.
Pu*:					
Palm Beach----------	Slight**----------	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Urban land.					
Pv------------------- Perrine Variant	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
Sa------------------- Sanibel	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
St------------------- St. Lucie	Slight**----------	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.

See footnotes at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Tc------------------ Terra Ceia	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
Ud*----------------- Udorthents	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Um*:					
Udorthents---------	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
Urban land.					
Un*----------------- Udorthents	Severe: wetness, poor filter.	Severe: seepage, wetness, large stones.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Uo*:					
Udorthents---------	Severe: wetness, poor filter.	Severe: seepage, wetness, large stones.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Urban land.					
Ur*. Urban land					

* See description of the map unit for composition and behavior characteristics of the map unit.
** Ground water contamination may be a hazard because of poor filtration in areas where there are many septic tank absorption fields.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Ae*:				
Arents	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Ao*:				
Arents	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Ba Basinger	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Bc Boca	Poor: thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Be*. Beaches				
Ca*:				
Canaveral	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Da Dania	Poor: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, excess humus, wetness.
Dd Dade	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Df*:				
Duette	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Du*:				
Dade	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Ha Hallandale	Poor: area reclaim, thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Hb*:				
Hallandale	Poor: area reclaim, thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Urban land.				

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Hm*:				
Hallandale	Poor: area reclaim, thin layer, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Margate	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Ia Immokalee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Ir*, Iu*:				
Immokalee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Urban land.				
La Lauderhill	Poor: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
Ma Margate	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Mu*:				
Margate	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Urban land.				
Ok Okeelanta	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Pa Paola	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Pb*:				
Paola	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Pc Palm Beach	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Pe, Pf Pennsuco	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pm Plantation	Poor: area reclaim, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: excess humus, wetness.
Po Pomello	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Pp Pompano	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Ps: Perrine	Poor: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pu*: Palm Beach	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Urban land.				
Pv: Perrine Variant	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sa: Sanibel	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
St: St. Lucie	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Tc: Terra Ceia	Poor: low strength, wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Ud*: Udorthents	Fair: large stones, slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
Um*: Udorthents	Fair: wetness, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, small stones.
Urban land.				
Un*: Udorthents	Fair: area reclaim, thin layer, large stones.	Improbable: thin layer.	Improbable: thin layer.	Poor: too sandy, small stones.
Uo*: Udorthents	Fair: area reclaim, thin layer, large stones.	Improbable: thin layer.	Improbable: thin layer.	Poor: too sandy, small stones.
Urban land.				
Ur*. Urban land				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for-- Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ae*: Arents	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
Urban land.						
Ao*: Arents	Severe: seepage, hard to pack.	Moderate: deep to water.	Cutbanks cave	Droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Urban land.						
Ba: Basinger	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Bc: Boca	Severe: seepage, piping, wetness.	Moderate: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
Be*. Beaches						
Ca*: Canaveral	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Urban land.						
Da: Dania	Severe: excess humus, ponding.	Severe: depth to rock, cutbanks cave.	Ponding, depth to rock, subsides.	Ponding, soil blowing, depth to rock.	Depth to rock, ponding, soil blowing.	Wetness, depth to rock.
Dd: Dade	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Depth to rock, too sandy, soil blowing.	Droughty, depth to rock.
Df*: Duette	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.						
Du*: Dade	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Depth to rock, too sandy, soil blowing.	Droughty, depth to rock.
Urban land.						
Ha: Hallandale	Severe: seepage, piping, wetness.	Severe: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Hb*:						
Hallandale	Severe: seepage, piping, wetness.	Severe: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
Urban land.						
Hm*:						
Hallandale	Severe: seepage, piping, wetness.	Severe: depth to rock, cutbanks cave.	Depth to rock, cutbanks cave.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
Margate	Severe: seepage, piping, ponding.	Severe: depth to rock, cutbanks cave.	Ponding, depth to rock.	Ponding, droughty, fast intake.	Depth to rock, ponding, too sandy.	Wetness, droughty, depth to rock.
Ia: Immokalee	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ir*, Iu*:						
Immokalee	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Urban land.						
La: Lauderhill	Severe: excess humus, ponding.	Severe: depth to rock.	Ponding, depth to rock, subsides.	Ponding, soil blowing, depth to rock.	Depth to rock, ponding, soil blowing.	Wetness, depth to rock.
Ma: Margate	Severe: seepage, piping, ponding.	Severe: depth to rock, cutbanks cave.	Ponding, depth to rock.	Ponding, droughty, fast intake.	Depth to rock, ponding, too sandy.	Wetness, droughty, depth to rock.
Mu*:						
Margate	Severe: seepage, piping, ponding.	Severe: depth to rock, cutbanks cave.	Ponding, depth to rock.	Ponding, droughty, fast intake.	Depth to rock, ponding, too sandy.	Wetness, droughty, depth to rock.
Urban land.						
Ok: Okeelanta	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
Pa: Paola	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Pb*:						
Paola	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.						
Pc: Palm Beach	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Pe: Pennsuco	Severe: piping, wetness.	Severe: cutbanks cave.	Favorable	Wetness	Wetness	Wetness.
Pf: Pennsuco	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding	Flooding, excess salt.	Wetness	Wetness, excess salt.
Pm: Plantation	Severe: seepage, piping, excess humus.	Severe: depth to rock, cutbanks cave.	Ponding, depth to rock.	Ponding, soil blowing, depth to rock.	Depth to rock, ponding, too sandy.	Wetness, depth to rock.
Po: Pomello	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
Pp: Pompano	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ps: Perrine	Severe: thin layer, piping, wetness.	Severe: depth to rock.	Depth to rock	Wetness, depth to rock.	Depth to rock, wetness.	Wetness, depth to rock.
Pu*:						
Palm Beach	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Urban land.						
Pv: Perrine Variant	Severe: excess humus, wetness.	Slight	Flooding	Wetness, flooding.	Wetness	Wetness.
Sa: Sanibel	Severe: seepage, piping, excess humus.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Ponding, too sandy, soil blowing.	Wetness.
St: St. Lucie	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Tc: Terra Ceia	Severe: excess humus, wetness.	Severe: cutbanks cave.	Flooding, subsides.	Wetness, flooding, excess salt.	Wetness, soil blowing.	Wetness, excess salt.
Ud*: Udorthents	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope, fast intake.	Large stones, too sandy, slope.	Large stones, droughty, slope.
Um*:						
Udorthents	Severe: piping.	Severe: cutbanks cave.	Favorable	Large stones, wetness, fast intake.	Large stones, wetness.	Droughty, large stones.
Urban land.						
Un*: Udorthents	Severe: seepage.	Severe: cutbanks cave.	Cutbanks cave, slope, large stones.	Wetness, droughty, large stones.	Large stones, wetness, too sandy.	Large stones, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Uo*:						
Udorthents-------	Severe: seepage.	Severe: cutbanks cave.	Large stones, cutbanks cave.	Wetness, droughty, large stones.	Large stones, wetness, too sandy.	Large stones, droughty.
Urban land.						
Ur*. Urban land						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ae*:											
Arents----------	0-9	Sand, fine sand	SP, SP-SM	A-3, A-2-4, A-1-b	0-15	60-90	50-80	40-70	2-12	---	NP
	9-32	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
	32-60	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
Urban land.											
Ao*:											
Arents----------	0-12	Sand, fine sand	SP, SP-SM	A-3, A-2-4, A-1-b	0-15	60-90	50-80	40-70	2-12	---	NP
	12-38	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
	38-52	Muck-------------	PT	A-8	0	---	---	---	---	---	---
	52-72	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
Urban land.											
Ba--------------- Basinger	0-23	Fine sand--------	SP	A-3	0	100	100	85-100	1-4	---	NP
	23-35	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
	35-60	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	85-100	2-12	---	NP
Bc--------------- Boca	0-7	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	80-99	2-12	---	NP
	7-25	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-99	2-12	---	NP
	25-32	Sandy loam, sandy clay loam.	SC	A-2-4, A-6, A-2-6	0	100	100	80-99	25-40	16-37	5-20
	32-34	Variable---------	---	---	0	---	---	---	---	---	---
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Be*. Beaches											
Ca*:											
Canaveral-------	0-6	Sand-------------	SP	A-3	0	100	100	90-100	1-4	---	NP
	6-80	Fine sand, sand, coarse sand.	SP	A-3	0	70-100	70-95	65-90	1-3	---	NP
Urban land.											
Da--------------- Dania	0-14	Muck-------------	PT	---	0	---	---	---	---	---	---
	14-18	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	95-100	80-95	2-15	<25	NP-3
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dd--------------- Dade	0-27	Fine sand--------	SP, SP-SM	A-3	0	100	100	89-100	1-6	---	NP
	27-35	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-8	---	NP
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Df*:											
Duette----------	0-3	Sand-------------	SP	A-3	0	100	100	60-100	1-4	---	NP
	3-66	Fine sand, sand	SP	A-3	0	100	100	60-100	1-4	---	NP
	66-80	Fine sand, sand	SP, SP-SM	A-3, A-2-4	0	100	100	60-100	4-12	---	NP
Urban land.											
Du*:											
Dade------------	0-27	Fine sand--------	SP, SP-SM	A-3	0	100	100	89-100	1-6	---	NP
	27-35	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-8	---	NP
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Ha--------------- Hallandale	0-4	Fine sand--------	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	4-10	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	10-14	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	14-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Hb*:											
Hallandale------	0-4	Fine sand--------	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	4-10	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	10-14	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	14-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Hm*:											
Hallandale------	0-4	Fine sand--------	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	4-10	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	10-14	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	14-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	90-100	2-6	---	NP
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Margate---------	0-8	Fine sand--------	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	8-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	16-28	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	28-32	Variable---------	---	---	---	---	---	---	---	---	---
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ia--------------- Immokalee	0-6	Fine sand--------	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	6-40	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	40-65	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	65-80	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
Ir*:											
Immokalee-------	0-5	Fine sand--------	SP, SP-SM	A-3	0	100	100	85-99	2-10	---	NP
	5-48	Sand, fine sand	SP, SP-SM	A-3	0	100	100	85-99	2-10	---	NP
	48-58	Sand, fine sand	SP-SM, SM	A-3, A-2-4	0	100	100	80-99	5-15	---	NP
	58	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Iu*:											
Immokalee-------	0-6	Fine sand--------	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	6-35	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
	35-54	Fine sand, sand	SP-SM, SM	A-3, A-2-4	0	100	100	70-100	5-21	---	NP
	54-72	Fine sand, sand	SP, SP-SM	A-3	0	100	100	70-100	2-10	---	NP
Urban land.											

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
La------------ Lauderhill	0-31	Muck------------	PT	---	0	---	---	---	---	---	---
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ma------------ Margate	0-8	Fine sand--------	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	8-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	16-28	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	28-32	Variable---------	---	---	---	---	---	---	---	---	---
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mu*:											
Margate---------	0-8	Fine sand--------	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	8-16	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	16-28	Fine sand, sand	SP, SP-SM	A-3	0	100	100	93-100	2-8	---	NP
	28-32	Variable---------	---	---	---	---	---	---	---	---	---
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
Ok------------ Okeelanta	0-40	Muck------------	PT	A-8	0	---	---	---	---	---	---
	40-60	Fine sand, sand, loamy sand.	SP, SP-SM, SM	A-3, A-2-4	0	100	85-100	80-95	2-15	---	NP
Pa------------ Paola	0-26	Fine sand--------	SP	A-3	0	100	100	85-100	1-2	---	NP
	26-83	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
Pb*:											
Paola-----------	0-25	Fine sand--------	SP	A-3	0	100	100	85-100	1-2	---	NP
	25-80	Sand, fine sand	SP	A-3	0	100	100	80-100	1-4	---	NP
Urban land.											
Pc------------ Palm Beach	0-80	Sand------------	SP-SM, SP, SW	A-1-b, A-3, A-2-4	0	100	75-95	15-90	1-5	---	NP
Pe, Pf---------- Pennsuco	0-5	Silty clay loam	ML, CL-ML, CL	A-4, A-6	0	100	100	98-100	85-95	<40	NP-19
	5-38	Silt, silt loam	ML	A-4	0	100	100	98-100	85-95	---	NP
	38-53	Sand, fine sand, loamy sand.	SP, SP-SM	A-3, A-2-4	0	100	100	85-99	2-12	---	NP
	53-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pm------------ Plantation	10-0	Muck------------	PT	---	---	---	---	---	---	---	---
	0-25	Sand, fine sand	SP	A-3	0	100	100	90-100	1-4	---	NP
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Po------------ Pomello	0-38	Fine sand--------	SP, SP-SM	A-3	0	100	100	60-100	1-8	---	NP
	38-72	Coarse sand, sand, fine sand.	SP-SM, SM	A-3, A-2-4	0	100	100	60-100	6-15	---	NP
	72-80	Coarse sand, sand, fine sand.	SP, SP-SM	A-3	0	100	100	60-100	4-10	---	NP
Pp------------ Pompano	0-80	Fine sand--------	SP, SP-SM	A-3, A-2-4	0	100	100	75-100	1-12	---	NP
Ps------------ Perrine	0-10	Silty clay loam	ML, CL-ML	A-4	0	100	100	98-100	85-95	<40	NP-19
	10-26	Silt, silt loam	ML	A-4	0	100	100	98-100	85-95	---	NP
	26-30	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pu*:											
Palm Beach------	0-80	Sand------------	SP-SM, SP, SW	A-1-b, A-3, A-2-4	0	100	75-95	15-90	1-5	---	NP
Urban land.											

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pv------------- Perrine Variant	0-8	Silt loam--------	ML, CL	A-4, A-6	0	100	100	98-100	85-95	<40	NP-19
	8-26	Silt, silt loam	ML	A-4	0	100	100	98-100	85-95	---	NP
	26-80	Muck-------------	PT	A-8	0	---	---	---	---	---	---
Sa------------- Sanibel	9-0	Muck-------------	PT	---	0	---	---	---	---	---	---
	0-60	Sand, fine sand	SP, SP-SM	A-3	0	100	100	80-95	1-10	---	NP
St------------- St. Lucie	0-94	Fine sand--------	SP	A-3	0	100	100	85-99	1-4	---	NP
Tc------------- Terra Ceia	0-66	Muck-------------	PT	---	0	---	---	---	---	---	---
	66-80	Sand, fine sand, loamy sand.	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
Ud*------------ Udorthents	0-57	Cobbly sand------	SP, SP-SM, GP-GM	A-1-b	15-40	50-70	40-60	30-50	2-12	---	NP
Um*: Udorthents------	0-32	Cobbly sand------	SP, SP-SM	A-3, A-2-4, A-1-b	15-40	60-90	50-80	40-70	2-12	---	NP
	32-60	Marl-------------	ML	A-4	---	100	100	95-99	85-95	---	NP
Urban land.											
Un*------------ Udorthents	0-30	Cobbly sand------	SP, SP-SM, GP, GP-GM	A-3, A-2-4, A-1-b	10-40	50-80	40-70	30-60	2-12	---	NP
	30-50	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Uo*: Udorthents------	0-30	Cobbly sand------	SP, SP-SM, GP, GP-GM	A-3, A-2-4, A-1-b	10-40	50-80	40-70	30-60	2-12	---	NP
	30-50	Sand, fine sand	SP, SP-SM	A-3, A-2-4	0	100	100	80-95	2-12	---	NP
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Urban land.											
Ur*. Urban land											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Ae*:												
Arents----------	0-9	1-10	1.35-1.55	6.0-20	0.02-0.08	6.6-8.4	<2	Low--------	0.10	5	2	<.5
	9-32	1-10	1.35-1.55	6.0-20	0.02-0.08	5.6-8.4	<2	Low--------	0.10			
	32-60	1-10	1.35-1.55	6.0-20	0.02-0.08	5.6-6.5	<2	Low--------	0.10			
Urban land.												
Ao*:												
Arents----------	0-12	1-10	1.35-1.55	6.0-20	0.02-0.10	6.6-8.4	<2	Low--------	0.10	5	2	---
	12-38	1-10	1.35-1.55	6.0-20	0.02-0.10	5.6-7.3	<2	Low--------	0.10			
	38-52	---	0.20-0.40	6.0-20	0.30-0.50	5.1-7.3	<2	Low--------	----			
	52-72	1-5	1.35-1.55	6.0-20	0.02-0.10	5.1-7.3	<2	Low--------	0.10			
Urban land.												
Ba---------------- Basinger	0-23	.5-4	1.40-1.55	>20	0.03-0.07	3.6-8.4	<2	Low--------	0.10	5	2	.5-2
	23-35	1-6	1.40-1.65	>20	0.10-0.15	3.6-7.3	<2	Low--------	0.10			
	35-60	1-3	1.50-1.70	>20	0.05-0.10	3.6-7.3	<2	Low--------	0.10			
Bc---------------- Boca	0-7	<2	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.10	5	2	1-3
	7-25	.5-2	1.50-1.60	6.0-20	0.02-0.05	5.1-8.4	<2	Low--------	0.17			
	25-32	15-30	1.55-1.65	0.6-2.0	0.10-0.15	5.1-8.4	<2	Low--------	0.20			
	32-34	---	---	---	---	---	---	-----------	----			
	34	---	---	---	---	---	---	-----------	----			
Be*. Beaches												
Ca*:												
Canaveral--------	0-6	<2	1.25-1.50	>20	0.02-0.05	6.6-8.4	<2	Low	0.10	5	2	<.5
	6-80	<1	1.25-1.50	>20	0.02-0.05	6.6-8.4	<2	Low	0.10			
Urban land.												
Da---------------- Dania	0-14	---	0.15-0.35	6.0-20	0.20-0.30	5.6-7.3	<2	Low--------	----	---	2	>60
	14-18	2-10	1.45-1.55	6.0-20	0.02-0.10	6.6-8.4	<2	Low--------	0.10			
	18	---	---	---	---	---	---	-----------	----			
Dd---------------- Dade	0-27	0-2	1.45-1.60	>20	0.02-0.05	6.1-8.4	<2	Low--------	0.10	5	2	<.5
	27-35	1-5	1.45-1.60	>20	0.02-0.05	6.6-8.4	<2	Low--------	0.10			
	35	---	---	---	---	---	---	-----------	----			
Df*:												
Duette----------	0-3	<2	1.30-1.55	>20	0.03-0.06	4.5-7.8	<2	Low--------	0.10	5	1	<1
	3-66	<2	1.40-1.70	>20	0.02-0.05	4.5-7.8	<2	Low--------	0.10			
	66-80	1-5	1.45-1.60	2.0-6.0	0.10-0.15	4.5-6.5	<2	Low--------	0.10			
Urban land.												
Du*:												
Dade------------	0-27	0-2	1.45-1.60	>20	0.02-0.05	6.1-8.4	<2	Low--------	0.10	5	2	<.5
	27-35	1-5	1.45-1.60	>20	0.02-0.05	6.6-8.4	<2	Low--------	0.10			
	35	---	---	---	---	---	---	-----------	----			
Urban land.												
Ha---------------- Hallandale	0-4	<3	1.35-1.45	6.0-20	0.05-0.11	5.1-6.5	<2	Low--------	0.10	2	2	2-5
	4-10	<3	1.50-1.60	6.0-20	0.03-0.08	6.1-6.5	<2	Low--------	0.10			
	10-14	<3	1.50-1.60	0.6-6.0	0.03-0.08	5.6-8.4	<2	Low--------	0.10			
	14-16	<5	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.10			
	16	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
									K	T		
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Hb*:												
Hallandale------	0-4	<3	1.35-1.45	6.0-20	0.05-0.11	5.1-6.5	<2	Low--------	0.10	2	2	2-5
	4-10	<3	1.50-1.60	6.0-20	0.03-0.08	6.1-6.5	<2	Low--------	0.10			
	10-14	<3	1.50-1.60	0.6-6.0	0.03-0.08	5.6-8.4	<2	Low--------	0.10			
	14-16	<5	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.10			
	16	---	---	---	---	---	---	-----------	----			
Urban land.												
Hm*:												
Hallandale------	0-4	<3	1.35-1.45	6.0-20	0.05-0.11	5.1-6.5	<2	Low--------	0.10	2	2	2-5
	4-10	<3	1.50-1.60	6.0-20	0.03-0.08	6.1-6.5	<2	Low--------	0.10			
	10-14	<3	1.50-1.60	0.6-6.0	0.03-0.08	5.6-8.4	<2	Low--------	0.10			
	14-16	<5	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.10			
	16	---	---	---	---	---	---	-----------	----			
Margate---------	0-8	1-4	1.25-1.45	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.10	3	2	1-4
	8-16	0-4	1.55-1.65	6.0-20	0.03-0.06	5.1-6.5	<2	Low--------	0.10			
	16-28	1-4	1.55-1.65	6.0-20	0.03-0.06	6.1-7.8	<2	Low--------	0.10			
	28-32	3-10	1.55-1.65	6.0-20	0.03-0.10	7.4-8.4	<2	Low--------	0.17			
	32	---	---	---	---	---	---	-----------	----			
Ia---------------- Immokalee	0-6	1-5	1.20-1.50	6.0-20	0.05-0.10	3.6-6.0	<2	Low--------	0.10	5	2	1-2
	6-40	1-5	1.45-1.70	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
	40-65	2-7	1.30-1.60	0.6-2.0	0.10-0.25	3.6-6.0	<2	Low--------	0.15			
	65-80	1-5	1.40-1.60	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
Ir*:												
Immokalee-------	0-5	1-5	1.20-1.50	>6.0	0.05-0.10	5.1-7.8	<2	Low--------	0.10	5	2	1-2
	5-48	1-5	1.40-1.70	>6.0	0.02-0.05	5.1-7.8	<2	Low--------	0.10			
	48-58	2-7	1.30-1.60	0.6-6.0	0.10-0.25	5.1-7.8	<2	Low--------	0.15			
	58	---	---	---	---	---	---	-----------	----			
Urban land.												
Iu*:												
Immokalee-------	0-6	1-5	1.20-1.50	6.0-20	0.05-0.10	3.6-6.0	<2	Low--------	0.10	5	2	1-2
	6-35	1-5	1.45-1.70	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
	35-54	2-7	1.30-1.60	0.6-2.0	0.10-0.25	3.6-6.0	<2	Low--------	0.15			
	54-72	1-5	1.40-1.60	6.0-20	0.02-0.05	3.6-6.0	<2	Low--------	0.10			
Urban land.												
La---------------- Lauderhill	0-31	---	0.15-0.35	6.0-20	0.20-0.30	5.6-7.8	<2	Low--------	----	---	2	>55
	31	---	---	---	---	---	---	-----------	----			
Ma---------------- Margate	0-8	1-4	1.25-1.45	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.10	3	2	1-4
	8-16	0-4	1.55-1.65	6.0-20	0.03-0.06	5.1-6.5	<2	Low--------	0.10			
	16-28	1-4	1.55-1.65	6.0-20	0.03-0.06	6.1-7.8	<2	Low--------	0.10			
	28-32	3-10	1.55-1.65	6.0-20	0.03-0.10	7.4-8.4	<2	Low--------	0.17			
	32	---	---	---	---	---	---	-----------	----			
Mu*:												
Margate---------	0-8	1-4	1.25-1.45	6.0-20	0.05-0.10	4.5-6.0	<2	Low--------	0.10	3	2	1-4
	8-16	0-4	1.55-1.65	6.0-20	0.03-0.06	5.1-6.5	<2	Low--------	0.10			
	16-28	1-4	1.55-1.65	6.0-20	0.03-0.06	6.1-7.8	<2	Low--------	0.10			
	28-32	3-10	1.55-1.65	6.0-20	0.03-0.10	7.4-8.4	<2	Low--------	0.17			
	32	---	---	---	---	---	---	-----------	----			
Urban land.												
Ok---------------- Okeelanta	0-40	---	0.22-0.38	6.0-20	0.20-0.30	4.5-6.5	<2	Low--------	----	---	2	>60
	40-60	1-5	1.30-1.55	6.0-20	0.05-0.10	5.1-7.8	<2	Low--------	0.15			
Pa---------------- Paola	0-26	<2	1.45-1.60	>20	0.02-0.05	4.5-7.3	<2	Low--------	0.10	5	1	<.5
	26-83	<3	1.45-1.60	>20	0.02-0.05	4.5-7.3	<2	Low--------	0.10			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Pb*:												
Paola-----------	0-25	<2	1.45-1.60	>20	0.02-0.05	4.5-7.3	<2	Low--------	0.10	5	1	<.5
	25-80	<3	1.45-1.60	>20	0.02-0.05	4.5-7.3	<2	Low--------	0.10			
Urban land.												
Pc--------------- Palm Beach	0-80	<2	1.25-1.50	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	1	<.5
Pe--------------- Pennsuco	0-5	15-30	1.00-1.20	0.2-2.0	0.15-0.20	7.9-8.4	<4	Low--------	0.32	3	4L	3-6
	5-38	2-18	0.95-1.05	0.6-6.0	0.20-0.45	7.9-8.4	<4	Low--------	0.32			
	38-53	1-8	1.40-1.60	6.0-20	0.10-0.20	6.6-8.4	<4	Low--------	0.15			
	53-80	---	---	---	---	---	---	-----------	----			
Pf--------------- Pennsuco	0-5	15-30	1.00-1.20	0.2-2.0	0.15-0.20	7.9-8.4	4-8	Low--------	0.32	3	4L	3-6
	5-38	2-18	0.95-1.05	0.6-6.0	0.20-0.45	7.9-8.4	4-8	Low--------	0.32			
	38-53	1-8	1.40-1.60	6.0-20	0.10-0.20	6.6-8.4	4-8	Low--------	0.15			
	53-80	---	---	---	---	---	---	-----------	----			
Pm--------------- Plantation	10-0	---	0.15-0.35	6.0-20	0.20-0.30	4.5-6.0	<2	Low--------	----	---	2	>50
	0-25	1-3	1.50-1.60	6.0-20	0.02-0.05	5.1-7.3	<2	Low--------	0.10			
	25	---	---	---	---	---	---	-----------	----			
Po--------------- Pomello	0-38	<2	1.35-1.65	>20	0.02-0.05	4.5-6.0	<2	Low	0.10	5	1	<1
	38-72	<2	1.45-1.60	2.0-6.0	0.10-0.30	4.5-6.0	<2	Low	0.15			
	72-80	<2	1.35-1.65	6.0-20	0.02-0.05	4.5-6.0	<2	Low	0.10			
Pp--------------- Pompano	0-80	<5	1.30-1.65	>20	0.02-0.05	4.5-7.8	<2	Low--------	0.10	5	2	1-5
Ps--------------- Perrine	0-10	15-30	1.00-1.20	0.2-2.0	0.15-0.20	7.9-8.4	<4	Low--------	0.32	3	4L	3-6
	10-26	2-18	0.95-1.05	0.6-6.0	0.20-0.45	7.9-8.4	<4	Low--------	0.32			
	26-30	---	---	---	---	---	---	-----------	----			
Pu*:												
Palm Beach------	0-80	<2	1.25-1.50	>20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	1	<.5
Urban land.												
Pv--------------- Perrine Variant	0-8	15-30	1.00-1.20	0.2-2.0	0.15-0.20	7.9-8.4	2-4	Low--------	0.32	3	4L	3-6
	8-26	2-18	0.95-1.05	0.6-6.0	0.20-0.45	7.9-8.4	2-4	Low--------	0.32			
	26-80	<5	0.20-0.30	6.0-20	0.20-0.50	7.9-8.4	2-4	Low--------	----			
Sa--------------- Sanibel	9-0	---	0.15-0.25	6.0-20	0.20-0.25	3.6-7.3	<2	Low--------	----	4	2	>45
	0-60	2-6	1.50-1.60	6.0-20	0.10-0.15	3.6-7.3	<2	Low--------	0.10			
St--------------- St. Lucie	0-94	<2	1.50-1.60	>20	0.02-0.05	3.6-7.3	<2	Low--------	0.10	5	1	<1
Tc--------------- Terra Ceia	0-66	---	0.22-0.38	6.0-20	0.20-0.50	6.6-8.4	4-8	Low--------	----	---	2	>60
	66-80	2-10	1.35-1.50	6.0-20	0.02-0.08	6.6-8.4	4-8	Low--------	0.10			
Ud*-------------- Udorthents	0-57	<5	1.35-1.45	6.0-20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	8	---
Um*:												
Udorthents------	0-32	1-5	1.35-1.50	6.0-20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	8	---
	32-60	5-25	1.30-1.40	0.6-2.0	0.15-0.20	7.4-8.4	<2	Low--------	0.32			
Urban land.												
Un*-------------- Udorthents	0-30	1-5	1.35-1.45	6.0-20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	8	---
	30-50	1-10	1.35-1.55	6.0-20	0.02-0.08	5.1-7.3	<2	Low--------	0.10			
	50	---	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
Uo*:												
Udorthents------	0-30	1-5	1.35-1.45	6.0-20	0.02-0.05	7.4-8.4	<2	Low--------	0.10	5	8	---
	30-50	1-10	1.35-1.55	6.0-20	0.02-0.08	5.1-7.3	<2	Low--------	0.10			
	50	---	---	---	---	---	---	-----------	----			
Urban land.												
Ur*. Urban land												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock	Initial	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	depth	subsidence	Uncoated steel	Concrete
					Ft			In	In		
Ae**:											
Arents	B	None	---	---	1.5-4.0	Apparent	Jun-Nov	>60	---	High	Moderate.
Urban land.											
Ao**:											
Arents	B	None	---	---	2.0-4.0	Apparent	Jun-Nov	>60	---	High	High.
Urban land.											
Ba Basinger	B/D	None	---	---	0-1.0	Apparent	Jun-Feb	>60	---	High	Moderate.
Bc Boca	B/D	None	---	---	0-1.0	Apparent	Jun-Feb	24-40	---	High	Moderate.
Be**. Beaches											
Ca**:											
Canaveral	C	None	---	---	1.0-3.0	Apparent	Jun-Nov	>60	---	Moderate	Low.
Urban land.											
Da Dania	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	8-20	4-8	High	Moderate.
Dd Dade	A	None	---	---	5.0-6.0	Apparent	Jun-Sep	20-40	---	Low	Moderate.
Df**:											
Duette	A	None	---	---	4.0-6.0	Apparent	Jun-Oct	>60	---	Low	High.
Urban land.											
Du**:											
Dade	A	None	---	---	5.0-6.0	Apparent	Jun-Sep	20-40	---	Low	Moderate.
Urban land.											
Ha Hallandale	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	7-20	---	High	Low.
Hb**:											
Hallandale	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	7-20	---	High	Low.
Urban land.											

See footnotes at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth*	High water table: Kind	High water table: Months	Bedrock depth	Initial subsidence	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In	In		
Hm**:											
Hallandale	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	7-20	---	High	Low.
Margate	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	20-40	---	High	Moderate.
Ia Immokalee	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	>60	---	High	High.
Ir**:											
Immokalee	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	40-72	---	High	Moderate.
Urban land.											
Iu**:											
Immokalee	B/D	None	---	---	0-1.0	Apparent	Jun-Nov	>60	---	High	High.
Urban land.											
La Lauderhill	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	20-40	4-8	High	Moderate.
Ma Margate	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	20-40	---	High	Moderate.
Mu**:											
Margate	B/D	None	---	---	+1-1.0	Apparent	Jun-Feb	20-40	---	High	Moderate.
Urban land.											
Ok Okeelanta	B/D	None	---	---	+1-0	Apparent	Jun-Jan	>60	16-20	High	Moderate.
Pa Paola	A	None	---	---	>6.0	---	---	>60	---	Low	High.
Pb**:											
Paola	A	None	---	---	>6.0	---	---	>60	---	Low	High.
Urban land.											
Pc Palm Beach	A	None	---	---	>6.0	---	---	>60	---	Low	Low.
Pe Pennsuco	D	None	---	---	0-1.0	Apparent	Jun-Nov	40-72	---	High	Low.
Pf Pennsuco	D	Frequent	Long	Jan-Dec	0-1.0	Apparent	Jan-Dec	40-72	---	High	Low.
Pm Plantation	B/D	None	---	---	+1-1.0	Apparent	Jun-Nov	20-40	4-8	High	Moderate.

See footnotes at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth*	High water table: Kind	High water table: Months	Bedrock depth	Initial subsidence	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In	In		
Po------------------- Pomello	C	None--------	---	---	2.0-3.5	Apparent	Jul-Nov	>60	---	Low------	High.
Pp------------------- Pompano	B/D	None--------	---	---	0-1.0	Apparent	Jun-Nov	>60	---	High-----	Moderate.
Ps------------------- Perrine	D	None--------	---	---	0-1.0	Apparent	Jun-Nov	20-40	---	High-----	Low.
Pu**:											
Palm Beach-----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
Urban land.											
Pv------------------- Perrine Variant	D	Frequent----	Long------	Jan-Dec	0-1.0	Apparent	Jan-Dec	>60	---	High-----	Low.
Sa------------------- Sanibel	B/D	None--------	---	---	+1-1.0	Apparent	Jun-Feb	>60	3-5	High-----	Low.
St------------------- St. Lucie	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Tc------------------- Terra Ceia	D	Frequent----	Very long	Jan-Dec	0-1.0	Apparent	Jan-Dec	>60	16-20	High-----	High.
Ud**----------------- Udorthents	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
Um**:											
Udorthents-----------	B	None--------	---	---	2.0-4.0	Apparent	Jan-Dec	>60	---	Moderate	Low.
Urban land.											
Un**----------------- Udorthents	B	None--------	---	---	2.0-4.0	Apparent	Jan-Dec	40-72	---	High-----	Moderate.
Uo**:											
Udorthents-----------	B	None--------	---	---	2.0-4.0	Apparent	Jan-Dec	40-72	---	High-----	Moderate.
Urban land.											
Ur**. Urban land											

* A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water is above the surface. The second numeral indicates the depth below the surface.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PARTICLE-SIZE DISTRIBUTION ANALYSIS OF SELECTED SOILS

[Analyzed by Soil Characterization Laboratory, Soil Science Department, University of Florida. The symbol < means less than]

Soil series and sample number	Horizon	Depth	Particle-size distribution: Very coarse sand (2-1 mm)	Coarse sand (1-0.5 mm)	Medium sand (0.5-0.25 mm)	Fine sand (0.25-0.10 mm)	Very fine sand (0.10-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
		In	Pct						
Basinger:									
(S72FL-011-10)	A1	0-6	0.0	3.0	25.3	65.7	3.6	0.8	1.6
	A21	6-13	0.1	2.4	25.7	67.2	3.6	0.6	0.4
	A22	13-17	0.0	2.8	27.3	65.3	3.2	0.9	0.5
	A3	17-23	0.0	3.0	25.3	65.5	3.4	0.2	2.6
	C&Bh	23-35	0.0	2.8	27.5	63.2	3.1	0.0	3.4
	C	35-60	0.1	4.2	36.4	55.8	2.4	0.4	0.7
Dade:									
(S80FL-011-007)	Ap	0-6	0.1	4.8	32.1	59.7	1.2	1.3	0.8
	A21	6-23	0.1	4.9	31.8	61.4	0.3	1.4	0.1
	A22	23-27	0.1	4.8	30.7	62.4	1.3	0.5	0.2
	B2h	27-32	0.1	4.8	28.5	63.3	1.0	1.7	0.6
	B3	32-35	0.1	3.8	25.6	68.0	1.3	0.4	0.8
Dania*:									
(S71FL-011-006)	IIC	14-16	0.3	5.2	25.6	56.2	3.8	5.4	3.5
Duette:									
(S80FL-011-008)	A1	0-3	0.0	6.3	50.6	40.3	0.9	0.9	1.0
	A21	3-8	0.0	7.2	50.8	41.2	0.7	0.0	0.1
	A22	8-50	0.1	6.9	50.0	42.3	0.6	0.0	0.1
	B1h	50-66	0.2	7.3	48.4	43.1	0.5	0.3	0.2
	B2h	66-80	0.1	7.5	49.3	40.6	0.7	0.1	1.7
Hallandale:									
(S71FL-011-003)	A1	0-4	0.1	1.0	16.2	71.1	2.4	5.0	4.2
	A2	4-10	0.0	1.0	15.4	79.0	2.6	0.8	1.2
	B1	10-14	0.0	1.3	16.3	77.3	1.8	0.8	2.5
	B2	14-16	0.0	1.4	17.3	72.5	2.5	1.0	5.3
Immokalee:									
(S80FL-011-009)	A1	0-5	0.1	8.1	43.3	44.5	0.7	2.0	1.3
	A21	5-13	0.1	9.8	45.3	44.0	0.7	0.0	0.1
	A22	13-48	0.1	?.8	42.1	49.1	0.7	0.0	0.1
	B2h	48-58	0.2	8.4	41.1	48.1	0.5	0.2	1.5
Margate:									
(S71FL-011-004)	Ap	0-8	0.1	6.6	35.3	53.4	1.6	1.5	1.5
	A2	8-16	0.1	3.2	24.7	67.7	2.9	0.5	0.9
	B1	16-26	0.1	3.3	23.9	68.4	2.7	0.1	1.5
	B12	26-28	0.1	2.7	22.1	67.8	2.2	0.9	4.2
	C	28-32	0.2	1.9	16.5	47.6	3.4	24.2	6.2
Pennsuco:									
(S80FL-011-006)	Ap	0-5	0.2	1.0	2.5	4.4	2.7	60.3	28.9
	B21	5-11	0.0	0.6	1.4	2.0	1.8	67.3	26.9
	B22	11-21	0.0	0.0	1.2	1.8	2.8	77.0	17.2
	B23	21-28	0.0	0.0	0.4	1.6	4.0	88.6	5.4
	B3	28-38	0.0	0.0	0.6	2.4	9.4	83.4	4.2
	IIC1	38-41	0.1	6.0	33.1	52.7	1.5	1.6	5.0
	IIC2	41-53	0.1	5.4	28.8	56.9	2.0	2.2	4.6
Plantation*:									
(S71FL-011-008)	IIA1	0-6	0.1	1.7	17.7	76.7	2.2	0.4	1.2
	IIA2	6-18	0.1	1.7	17.5	77.4	2.3	0.0	1.0
	IIC1	18-23	0.1	2.0	18.4	74.8	2.0	0.7	2.0
	IIC2	23-25	0.0	1.6	15.0	49.2	2.4	25.6	6.2

See footnote at end of table.

TABLE 16.--PARTICLE-SIZE DISTRIBUTION ANALYSIS OF SELECTED SOILS--Continued

Soil series and sample number	Horizon	Depth	Particle-size distribution						
			Very coarse sand (2-1 mm)	Coarse sand (1-0.5 mm)	Medium sand (0.5-0.25 mm)	Fine sand (0.25-0.10 mm)	Very fine sand (0.10-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
		In	Pct						
Pomello: (S72FL-011-015)	A1	0-5	0.1	3.1	24.1	63.9	2.6	5.2	1.0
	A21	5-8	0.1	3.9	27.6	65.1	1.9	1.0	0.4
	A22	8-38	0.1	3.5	25.1	68.5	2.0	0.5	0.3
	B21h	38-52	0.1	2.1	28.8	67.9	1.6	1.7	2.8
	B22h	52-72	0.0	1.2	19.2	74.2	2.1	1.5	1.8
	B3	72-80	0.0	2.3	22.0	70.8	2.8	0.9	1.2
Sanibel*: (S72FL-011-012)	IIC1	1-9	0.1	2.8	24.8	69.4	2.0	0.3	0.6
	IIC2	9-60	0.1	3.6	25.7	68.4	1.8	0.0	0.4

*Particle-size distribution analysis was not made on the organic horizons.

TABLE 17.--CHEMICAL PROPERTIES OF SELECTED SOILS

[Analyzed by Soil Characterization Laboratory, Soil Science Department, University of Florida. Dashes indicate no determination made]

Soil series and sample numbers	Horizon	Depth	Reaction			Extractable bases				Titratable acidity	Cation exchange capacity	Base saturation	Organic matter	Total nitrogen
			H_2O 1:1	0.01M $CaCl_2$ 1:2	1N KCl 1:1	Ca	Mg	Na	K					
		In	pH			Meq/100 g of soil						Pct		
Basinger: (S72FL-011-10)	A1	0-6	5.6	5.7	5.3	1.5	0.1	(*)	0.1	2.3	4.0	43	1.0	---
	A21	6-13	5.7	5.3	5.1	0.4	0.1	0.0	(*)	1.9	2.4	21	---	---
	A22	13-17	5.9	5.4	5.0	0.3	0.1	(*)	0.1	1.9	2.4	21	---	---
	A3	17-23	5.9	5.3	5.0	0.5	0.1	(*)	0.1	2.0	2.7	26	0.1	---
	C&Bh	23-35	6.0	5.2	5.1	0.9	0.1	(*)	0.1	2.0	3.1	35	0.3	---
	C	35-60	5.7	5.1	4.9	0.7	(*)	(*)	0.1	2.2	3.0	27	---	---
Dade: (S80FL-011-007)	Ap	0-6	7.3	6.7	7.0	4.6	0.3	0.3	0.0	0.8	6.0	87	1.2	---
	A21	6-23	7.8	6.6	7.1	0.2	0.0	0.0	0.0	0.4	0.6	33	0.1	---
	A22	23-27	7.5	6.6	6.9	0.3	0.0	0.0	0.0	0.1	0.4	75	0.1	---
	B2h	27-32	7.3	6.4	6.6	1.0	0.1	0.1	0.0	0.7	1.9	58	0.2	---
	B3	32-35	7.6	6.7	7.6	2.6	0.0	0.0	0.0	0.5	3.1	84	0.2	---
Dania: (S71FL-011-6)	Oa1	0-6	6.1	6.2	5.7	34.5	1.6	0.2	0.1	6.4	43.2	85	64.9	---
	Oa2	6-14	6.4	6.3	5.9	22.8	1.5	0.2	0.1	4.0	30.6	80	63.9	---
	IIC	14-16	7.1	6.4	6.1	5.0	0.3	0.1	0.1	0.1	5.6	98	2.3	---
Duette: (S80FL-011-008)	A1	0-3	7.6	6.8	7.2	0.8	0.2	0.0	0.0	0.4	1.4	71	1.4	---
	A21	3-8	7.4	6.6	6.9	0.8	0.0	0.0	0.0	0.0	0.8	100	0.2	---
	A22	8-50	7.3	6.4	6.7	0.1	0.0	0.0	0.0	0.0	0.1	100	0.1	---
	B1h	50-66	7.1	6.4	6.7	0.4	0.0	0.0	0.0	0.0	0.4	100	0.1	---
	B2h	66-80	6.5	5.4	5.3	8.8	0.4	0.1	0.0	10.2	19.4	47	3.7	---
Hallandale: (S71FL-011-003)	A1	0-4	5.8	5.2	5.1	9.3	0.7	0.3	0.1	5.3	15.7	66	7.4	0.3
	A2	4-10	6.2	5.6	5.7	1.4	0.1	0.1	(*)	0.7	2.3	70	0.5	(*)
	B1	10-14	6.3	6.4	6.0	1.2	0.1	0.2	(*)	0.3	1.8	83	---	---
	B2	14-16	7.4	7.4	7.1	12.7	0.3	0.2	0.1	0.0	13.3	100	---	(*)
	IIR	16+	8.2	7.6	7.9	179.0	3.1	1.8	3.4	0.0	187.1	100	---	---
Immokalee: (S80FL-011-009)	A1	0-5	7.4	6.8	7.4	9.0	0.2	(*)	(*)	0.1	9.3	100	1.0	---
	A21	5-13	7.3	6.7	7.0	0.5	(*)	0.0	0.0	0.0	0.5	100	0.2	---
	A22	13-48	7.2	6.4	6.5	0.1	(*)	0.0	0.0	0.0	0.1	100	0.1	---
	B2h	48-58	6.7	6.0	5.8	4.6	0.1	(*)	(*)	4.2	8.9	53	1.9	---

See footnote at end of table.

TABLE 17.--CHEMICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Horizon	Depth	Reaction			Extractable bases				Titratable acidity	Cation exchange capacity	Base saturation	Organic matter	Total nitrogen
			H_2O 1:1	0.01M $CaCl_2$ 1:2	1N KCl 1:1	Ca	Mg	Na	K					
		In	pH			Meq/100 g of soil						Pct		
Lauderhill: (S71FL-011-014)	Oa1	0-9	7.5	6.6	6.2	---	---	---	---	5.2	---	---	67.2	---
	Oa2	9-27	7.2	6.5	6.3	---	---	---	---	2.9	---	---	59.2	---
	Oa3	27-31	7.2	6.6	6.4	---	---	---	---	---	---	---	22.9	---
Margate: (S71FL-011-004)	Ap	0-8	5.7	4.7	5.0	2.3	0.2	0.2	(*)	2.9	5.6	48	1.6	0.1
	A2	8-16	6.2	5.9	6.0	1.1	0.1	0.1	0.1	0.9	2.4	63	---	---
	B1	16-26	6.4	6.5	6.4	1.0	0.1	0.2	0.1	0.3	1.7	82	---	---
	B12	26-28	7.2	7.0	7.1	15.9	0.1	0.3	0.1	(*)	16.4	100	---	(*)
Pennsuco: (S80FL-011-006)	Ap	0-5	7.3	7.2	7.8	35.8	2.5	13.7	0.2	1.1	53.3	98	4.3	---
	B21	5-11	7.6	7.2	7.8	28.5	1.6	10.2	0.0	0.0	40.3	100	3.1	---
	B22	11-21	7.7	7.2	7.9	26.0	1.6	8.7	0.0	0.5	36.8	99	3.6	---
	B23	21-28	7.7	7.3	7.9	21.8	1.2	7.7	0.0	0.4	31.1	99	2.2	---
	B3	28-38	7.7	7.3	7.8	25.0	1.2	6.8	0.0	0.6	33.6	98	2.8	---
	IICI	38-41	7.2	7.1	7.0	15.5	1.3	4.7	0.1	3.7	25.3	85	4.7	---
	IIC2	41-53	7.4	6.6	6.1	5.7	0.6	30.6	0.1	1.1	38.1	97	0.9	---
Plantation: (S71FL-011-008)	Oa1	10-6	5.9	5.3	5.2	63.6	3.5	1.1	0.3	4.1	72.6	94	50.0	2.4
	Oa2	6-0	5.8	5.4	5.4	30.3	1.1	0.6	0.3	2.3	34.6	93	63.4	1.6
	IIA1	0-6	6.3	5.8	5.9	1.3	0.1	0.2	(*)	1.9	3.5	46	---	---
	IIA2	6-18	6.3	6.2	6.2	0.6	0.1	0.2	(*)	0.6	1.5	60	---	---
	IIC1	18-23	7.1	7.2	7.7	6.3	0.1	0.2	(*)	0.0	6.6	100	---	---
	IIC2	23-25	8.1	7.3	7.8	192.0	1.1	2.5	0.3	0.0	196.0	100	---	---
Pomello: (S72FL-011-015)	A1	0-5	4.6	3.8	3.7	---	---	---	---	---	---	---	7.5	---
	A21	5-8	5.2	3.9	4.0	---	---	---	---	---	---	---	0.4	---
	A22	8-38	4.9	4.2	4.2	---	---	---	---	---	---	---	0.1	---
	B21h	38-52	4.6	3.7	3.5	---	---	---	---	---	---	---	3.1	---
	B22h	52-72	5.2	4.2	4.0	---	---	---	---	---	---	---	1.6	---
	B3	72-80	5.5	4.3	4.2	---	---	---	---	---	---	---	0.8	---
Sanibel: (S72FL-011-012)	Oa1	9-7	6.4	5.8	5.6	30.2	1.6	0.1	0.1	4.9	36.9	87	46.0	---
	Oa2	7-0	6.2	5.5	5.4	26.5	0.7	0.1	0.2	9.5	37.0	74	51.7	---
	IIA	0-1	6.1	5.7	5.7	3.7	0.1	(*)	0.1	1.9	5.8	67	1.9	---
	IIC1	1-9	6.4	5.5	5.6	0.8	0.1	(*)	0.1	0.3	1.3	77	0.3	---
	IIC2	9-60	6.4	5.8	5.7	0.5	(*)	0.0	(*)	0.2	0.7	71	---	---

* Trace.

TABLE 18.--PHYSICAL PROPERTIES OF SELECTED SOILS

[Analyzed by Soil Characterization Laboratory, Soil Science Department, University of Florida. Dashes indicate no determination made]

Soil series and sample numbers	Horizon	Depth	Resistivity	Corrosion potential	Bulk density	Saturated hydraulic conductivity	Water retention at pressure of--			Water retention difference
							0.10 bar	0.33 bar	15.00 bars	
		In	Ohms/cm		G/cm^3	Cm/hr	Pct			In/in
Basinger:										
(S72FL-011-10)	A1	0-6	1.0	0.1	1.55	38.5	11.9	3.7	1.1	0.17
	A21	6-13	0.7	0.1	1.54	34.5	2.7	1.6	1.3	0.02
	A22	13-17	1.3	0.1	1.57	33.2	2.7	1.4	1.2	0.02
	A3	17-23	1.3	0.1	1.58	30.3	2.5	1.1	0.5	0.03
	C&Bh	23-35	0.8	0.1	1.62	32.2	4.8	2.7	0.8	0.06
	C	35-60	2.0	0.2	1.63	43.6	3.9	2.0	0.7	0.05
Dade:										
(S80FL-011-007)	Ap	0-6	---	---	1.33	67.7	7.3	5.8	2.8	0.06
	A21	6-23	---	---	1.48	53.2	2.5	1.9	1.0	0.02
	A22	23-27	---	---	1.47	49.6	2.6	1.8	0.6	0.03
	B2h	27-32	---	---	1.54	36.8	4.1	2.8	0.5	0.06
	B3	32-35	---	---	1.56	30.2	3.1	1.8	0.3	0.04
Dania:										
(S71FL-011-6)	Oa1	0-6	4.9	0.7	0.20	221.0	280.0	235.0	179.0	0.11
	Oa2	6-14	3.4	0.3	0.13	577.0	539.0	436.0	240.0	0.24
	IIC	14-16	2.9	0.3	0.62	841.0	81.5	54.4	6.4	0.46
Duette:										
(S80FL-011-008)	A1	0-3	---	---	1.32	59.8	4.4	3.6	1.6	0.04
	A21	3-8	---	---	1.42	48.6	2.9	2.6	1.1	0.03
	A22	8-50	---	---	1.57	62.4	2.3	1.9	1.1	0.02
	B1h	50-66	---	---	1.57	46.0	2.4	1.7	0.7	0.03
	B2h	66-80	---	---	1.59	13.4	10.9	7.5	2.2	0.14
Hallandale:										
(S71FL-011-003)	A1	0-4	2.0	0.2	1.11	100.0	27.9	24.0	6.6	0.24
	A2	4-10	1.0	0.1	1.49	34.8	5.1	3.4	1.8	0.05
	B1	10-14	1.0	0.1	1.57	30.9	3.2	2.1	1.5	0.03
	B2	14-16	2.2	0.3	1.43	9.2	11.1	9.6	1.4	0.14
	IIR	16+	2.2	0.3	---	---	---	---	---	---
Immokalee:										
(S80FL-011-009)	A1	0-5	---	---	1.54	32.9	5.4	3.6	1.2	0.06
	A21	5-13	---	---	1.64	40.7	2.5	1.9	0.6	0.03
	A22	13-48	---	---	1.54	50.9	2.3	1.8	0.7	0.02
	B2h	48-58	---	---	1.48	13.4	14.7	9.9	2.2	0.18

TABLE 18.--PHYSICAL PROPERTIES OF SELECTED SOILS--Continued

Soil series and sample numbers	Horizon	Depth	Resistivity	Corrosion potential	Bulk density	Saturated hydraulic conductivity	Water retention at pressure of-- 0.10 bar	0.33 bar	15.00 bars	Water retention difference
		In	Ohms/cm		G/cm^3	Cm/hr	----------Pct----------			In/in
Lauderhill: (S71FL-011-014)	Oa1	0-9	2.9	0.4	---	---	---	---	---	---
	Oa2	9-27	3.2	0.5	---	---	---	---	---	---
	Oa3	27-31	2.9	0.4	---	---	---	---	---	---
Margate: (S71FL-011-004)	Ap	0-8	1.2	0.1	1.38	49.6	10.8	8.1	2.4	0.12
	A2	8-16	0.9	0.1	1.60	30.3	2.8	2.0	1.9	0.01
	B1	16-26	1.7	0.2	1.62	33.9	3.8	2.1	1.4	0.04
	B12	26-28	2.2	0.3	---	---	---	---	---	---
Pennsuco: (S80FL-011-006)	Ap	0-5	---	---	1.13	0.1	46.5	44.0	28.4	0.18
	B21	5-11	---	---	1.13	0.3	47.6	44.7	27.7	0.19
	B22	11-21	---	---	1.02	0.1	55.1	51.9	15.0	0.38
	B23	21-28	---	---	1.09	22.1	49.1	47.6	8.6	0.44
	B3	28-38	---	---	0.96	1.3	61.5	52.9	5.6	0.45
	IICI	38-41	---	---	1.38	5.4	28.4	21.9	4.1	0.34
	IIC2	41-53	---	---	1.59	2.4	13.0	8.2	2.0	0.17
Plantation: (S71FL-011-008)	Oa1	10-6	4.1	0.6	0.29	479.0	154.0	138.0	64.0	0.21
	Oa2	6-0	1.9	0.2	0.20	203.0	355.0	310.0	76.8	0.47
	IIA1	0-6	2.1	0.2	1.51	28.9	5.6	3.1	1.5	0.06
	IIA2	6-18	1.8	0.2	1.58	43.1	2.8	1.5	1.4	0.02
	IIC1	18-23	1.7	0.2	1.56	39.4	3.6	2.0	1.0	0.04
	IIC2	23-25	2.7	0.3	---	---	---	---	---	---
Sanibel: (S72FL-011-012)	Oa1	9-7	2.8	0.3	0.52	---	132.0	117.0	88.1	0.15
	Oa2	7-0	3.7	0.5	0.32	---	215.0	203.0	119.0	0.27
	IIA	0-1	3.0	0.4	---	---	---	---	---	---
	IIC1	1-9	2.5	0.4	1.63	---	3.5	1.9	1.5	0.03
	IIC2	9-60	1.8	0.2	1.63	---	3.4	2.1	1.8	0.03

TABLE 19.--ENGINEERING INDEX TEST DATA

[Tests performed by the Florida State Department of Transportation (FDOT) in cooperation with the U.S. Bureau of Public Roads, in accordance with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO) (1). All the soils tested are nonplastic]

Soil name and location	Parent material	FDOT report number	Depth	Moisture density: Maximum dry density	Moisture density: Optimum moisture content	Mechanical analysis: Percentage passing sieve--: No. 10 (2.0 mm)	Percentage passing sieve--: No. 40 (0.42 mm)	Percentage passing sieve--: No. 200 (0.074 mm)	Percentage smaller than--: 0.05mm	Percentage smaller than--: 0.005mm	Classification: AASHTO	Classification: Unified
			In	Lb/ft ^{3}	Pct							
Basinger fine sand*: About 50 feet west of University Dr. and 0.9 mile north of Orange Dr., SE1/4SE1/4 sec. 21, T. 50 S., R. 41 E.	Sandy marine sediment.	6-10	6-13	100	16	100	93	2	2	0	A-3(0)	SP
			23-35	104	14	100	93	3	3	0	A-3(0)	SP
			35-60	102	15	100	91	2	2	0	A-3(0)	SP
Dade fine sand**: About 1.5 miles east of U.S. Highway 441 and 200 feet north of Pembroke Rd. in Hollywood, SE1/4SE1/4NE1/4 sec. 19, T. 51 S., R. 42 E.	Sandy marine sediment.	11	6-23	101	13	100	89	1	1	0	A-3(0)	SP
Duette sand**: About 0.5 mile west of I-95, 1 block south of Broward Blvd. and 150 feet west of SW 27th Ave. NE1/4NE1/4NW1/4 sec. 8, T. 50 S., R. 42 E.	Sandy marine sediment.	12	8-50	102	13	100	87	1	1	1	A-3(0)	SP
		13	66-80	104	14	100	83	4	3	0	A-3(0)	SP
Hallandale fine sand*: About 0.5 mile north of Stirling Rd. and 0.2 mile east of Hunter Lane and Holatee Trail Junction, NE1/4NW1/4SW1/4 sec. 34, T. 50 S., R. 40 E.	Sandy marine sediment.	6-3	4-10	98	15	100	97	3	2	0	A-3(0)	SP

See footnotes at end of table.

TABLE 19.--ENGINEERING INDEX TEST DATA-Continued

Soil name and location	Parent material	FDOT report number	Depth	Moisture density: Maximum dry density	Moisture density: Optimum moisture content	Mechanical analysis: Percentage passing sieve--: No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--: 0.05mm	0.005mm	Classification: AASHTO	Unified
			In	Lb/ft^3	Pct							
Immokalee, limestone substratum**:												
About 0.5 mile north of South Fork Middle River and 500 feet east of Williston Dr., NE1/4SE1/4SE1/4 sec. 27, T. 49 S., R. 42 E.	Sandy marine sediment.	14	13-48	102	14	100	85	1	0	0	A-3(0)	SP
		15	48-58	101	18	100	90	8	4	0	A-3(0)	SP-SM
Margate fine sand*:												
About 1,980 feet south of Griffin Rd. and 2,640 feet west of 106th Ave. on Cherry Rd., SW1/4NW1/4 sec. 31, T. 50 S., R. 41 E.	Sandy marine sediment.	6-4	8-16	100	14	100	93	2	1	0	A-3(0)	SP
Pennsuco silty clay loam**:												
About 0.5 mile east of U.S. Highway 1 and 0.5 mile north of Dania Cut-off Canal; about 100 feet south of paved road, NW1/4SW1/4NW1/4 sec. 26, T. 50 S., R. 42 E.	Calcareous, silty marine sediment.	8	11-21	79	34	100	99	95	87	33	A-4(8)	ML
		9	28-38	77	34	100	99	90	75	12	A-4(8)	ML
		10	41-53	108	11	100	88	8	8	5	A-3(0)	SP-SM
Plantation muck*:												
About 520 feet west of Snake Creek Rd. and 1.1 miles north of Canal number 9, NW1/4SE1/4NE1/4 sec. 26, T. 51 S., R. 40 E.	Sandy marine sediment beneath a thin mantle of organic material.	6-8	18-23	98	16	100	96	1	1	0	A-3(0)	SP

See footnotes at end of table.

TABLE 19.--ENGINEERING INDEX TEST DATA--Continued

Soil name and location	Parent material	FDOT report number	Depth	Moisture density: Maximum dry density	Moisture density: Optimum moisture content	Mechanical analysis: Percentage passing sieve--No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Percentage smaller than--0.05mm	0.005mm	Classification: AASHTO	Unified
			In	Lb/ft^3	Pct							
Sanibel muck*:												
About 1.5 miles north of Hollywood Blvd. and 0.1 mile west of WGMA Radio Station on Palm Ave., SW1/4SW1/4 sec. 5, T. 51 S., R. 41 E.	Sandy marine sediment beneath a thin mantle of organic material.	6-12	9-60	98	13	100	93	1	0	0	A-3(0)	SP

*For this soil, the moisture density data are based on AASHTO Designation T99-57 (1), and the AASHTO classification is based on AASHTO Designation M145-49 (1). Mechanical analysis is according to AASHTO Designation T88-57 (1). Results by T88-57 differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all material including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

**Test on this soil was done in 1979 using the following: AASHTO Designation T88-78 for mechanical analysis, M145-73 for AASHTO classification, and T99-74 for moisture density.

TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Arents	Arents
Basinger	Siliceous, hyperthermic Spodic Psammaquents
Boca	Loamy, siliceous, hyperthermic Arenic Ochraqualfs
Canaveral	Hyperthermic, uncoated Aquic Quartzipsamments
Dade	Hyperthermic, uncoated Spodic Quartzipsamments
Dania	Euic, hyperthermic, shallow Lithic Medisaprists
Duette	Sandy, siliceous, hyperthermic Grossarenic Entic Haplohumods
Hallandale	Siliceous, hyperthermic Lithic Psammaquents
Immokalee	Sandy, siliceous, hyperthermic Arenic Haplaquods
Lauderhill	Euic, hyperthermic Lithic Medisaprists
Margate	Siliceous, hyperthermic Mollic Psammaquents
Okeelanta	Sandy or sandy-skeletal, siliceous, euic, hyperthermic Terric Medisaprists
Palm Beach	Hyperthermic, uncoated Typic Quartzipsamments
Paola	Hyperthermic, uncoated Spodic Quartzipsamments
Pennsuco	Coarse-silty, carbonatic, hyperthermic Typic Fluvaquents
Perrine	Coarse-silty, carbonatic, hyperthermic Typic Fluvaquents
Perrine Variant	Coarse-silty, carbonatic, hyperthermic Thapto-Histic Fluvaquents
Plantation	Sandy, siliceous, hyperthermic Histic Humaquepts
Pomello	Sandy, siliceous, hyperthermic Arenic Haplohumods
Pompano	Siliceous, hyperthermic Typic Psammaquents
Sanibel	Sandy, siliceous, hyperthermic Histic Humaquepts
St. Lucie	Hyperthermic, uncoated Typic Quartzipsamments
Terra Ceia	Euic, hyperthermic Typic Medisaprists
Udorthents	Udorthents

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